Bad behaviour or "poor" behaviour?: Mechanisms underlying socio-economic inequalities in maternal and child health-seeking in Egypt

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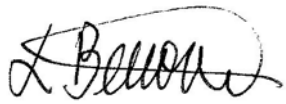
I, Lenka Beňová, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.



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Signature *Date*

Abstract

Background

Health-seeking behaviour is a key contributor to the widespread and unfair inequalities in health outcomes related to socio-economic position. This thesis compared the levels and determinants of maternal and child health-seeking between a national sample and the rural poor in Egypt, and examined whether existing inequalities could be explained by socio-cultural characteristics or ability to afford care.

Methods

This quantitative analysis relied on two datasets: the Egypt Demographic and Health Survey from 2008 and a 2010/11 survey of households below the poverty line in rural Upper Egypt. Latent variables capturing several dimensions of socio-economic position were constructed and used in multivariable regression models to predict several dimensions of maternal (antenatal and delivery care) and child (diarrhoea and acute respiratory infection) health-seeking.

Results

Latent constructs capturing socio-cultural and economic resources were identified in both datasets. Two further dimensions of socio-economic position in the Upper Egypt sample included dwelling quality and woman's status. DHS analysis showed that socio-cultural and economic capital were independently positively associated with seeking antenatal and delivery care among women, and with seeking timely and private child illness treatment. Free-of-charge public maternal care was not effectively targeted to poorest women. Poor households in Upper Egypt showed lower maternal health-seeking levels than nationally; both socio-cultural and economic resourcefulness positively predicted maternal health-seeking, dwelling quality was positively associated with private provider use, while women's status was not associated with any dimension of maternal health-seeking behaviour.

Conclusion

A better understanding of perceived and objective quality of care in both public and private sectors is required to reduce existing inequalities in the coverage of essential maternal and child health interventions. Improvement in free public care targeting is required to prevent catastrophically high expenditures for basic care among poor households.

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Acronyms and abbreviations

ANC	Antenatal care
ARI	Acute respiratory infection
CAPMAS	Central Agency for Public Mobilization and Statistics (Egypt)
CCT	Conditional Cash Transfer (Programme)
CFI	Comparative Fit Index
CI	Confidence interval
DHS	Demographic and Health Survey
EGP	Egyptian pound (currency)
FIML	Full information maximum likelihood
HIECS	Household Income, Expenditure and Consumption Survey
LMIC	Low- and middle-income country
LSHTM	London School of Hygiene and Tropical Medicine
MCH	Maternal and child health
MDG	Millennium Development Goal
MOHP	Ministry of Health and Population
MOSS/MOSA	Ministry of Social Solidarity (Affairs)
OR	Odds ratio
RMSEA	Root mean square error of approximation
SBA	Skilled birth attendant
SEP	Socio-economic position
SRC	Social Research Center (of the American University in Cairo)
TLI	Tucker Lewis Index
UE	Upper Egypt
UECCTBS	Upper Egypt CCT Baseline Survey (2010/2011, Assiut and Sohag)
UNICEF	United Nations Children's Fund
WLSMV	Weighted Least Squares, Mean and Variance adjusted estimator
WHO	World Health Organization

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Motivation of candidate

The topic of this thesis developed from my work designing and evaluating an experimental conditional cash transfer (CCT) program in Egypt. Inspired by the success of similar social protection programs in Latin America, the Egyptian CCT was targeted to poor households with children of school age. Its main premise was that intergenerational transfer of poverty could be broken if families received a monthly cash transfer and support by social workers to keep their children in school and attend basic preventive health visits at their local health clinics. These cash transfers were funded by the Egyptian Ministry of Social Solidarity and by the Social Research Center at the American University in Cairo, where I spent an intense and extremely valuable two-year period (2008-10) in the research team led by Professor Hania Sholkamy.

The first stage of the CCT program involved two field studies – a small two-year pilot in the Cairene slum of Ain es-Sira (200 families) which started in 2009, and a much larger community randomised trial in 65 poor villages in two Upper Egypt governorates, scheduled to enrol participants in early 2011.[1-3] My original PhD proposal intended to use the results of the Upper Egypt evaluation to examine whether and how participation in the CCT influenced maternal and child health-seeking behaviours. In particular, I aimed to assess whether changes in these behaviours were primarily attributable to the increase in families' financial resources or to improvements in the availability and quality of care provided by local clinics. The Upper Egypt baseline survey was conducted on a sample of applicants between December 2010 and January 2011. The day after the field team returned to Cairo, on January 25 2011, Egypt experienced political and societal turmoil unprecedented for a generation. While the pilot in Ain es-Sira continued for several more months, the Upper Egypt CCT program was cancelled and no transfers were made.

I observed these initial socio-political developments in Egypt with elation and great optimism from London, but the objectives of this thesis needed to be adjusted. The analyses presented here are based on a comparison between the population-representative Demographic and Health Survey (DHS) conducted in 2008 and the Upper Egypt CCT baseline survey. The observational nature of this thesis, compared to the original plan, carries more limitations concerning the causal interpretation of the findings. However, the presented findings are underpinned by several years of fieldwork in Ain es-Sira and six months of work on data cleaning/post-processing for the Upper Egypt baseline survey. I found both types of involvement extremely valuable in revising the objectives of this thesis and in my efforts to interpret the results of the

analyses. In particular, I was struck by a candid explanation from one mother in Ain es-Sira, Karima, whose preference for private care (for which she needed to borrow money) was not because she considered the quality of care she received there better compared to public services. She explained that she visited a private doctor in order to be treated respectfully, given time to ask questions, and provided with a clear explanation of the disease, treatment and prognosis.[4]

This dissertation is, in essence, an exploration of Egyptian women's interactions with their country's health system, reflected in the women's self-reports of decisions surrounding seeking of antenatal and delivery care, as well as care during their children's illness episodes. I explored the factors associated with these actions quantitatively, specifically focusing on identifying individual and household-level socio-economic factors that promote health-seeking behaviours – the choices and conditions on which women's decisions are based. The availability of the survey of poor households in rural Upper Egypt made it possible to assess whether levels and determinants of health-seeking behaviours differed from the nationally-representative Demographic and Health Survey. By using various constructs of socio-economic position and different dimensions of health-seeking (including choice of private providers), I investigated whether health-seeking behaviours among poor households are "bad", or whether they can be better understood as a reflection of poverty and of households' financial trade-offs and the health system's inability to consistently deliver acceptable, respectful, affordable and good quality care to all Egyptian citizens.

Section A. Thesis background, aims and objectives

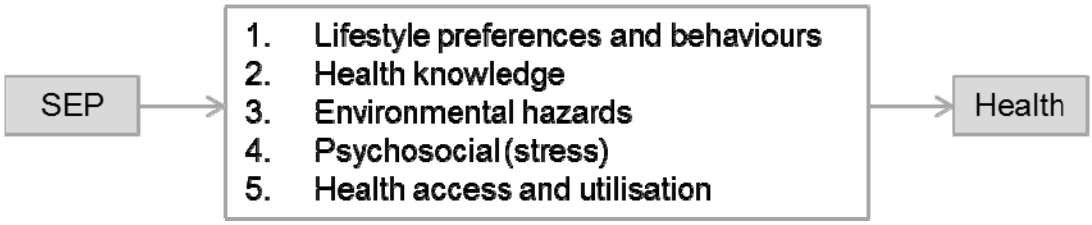
Thesis rationale: Socio-economic inequalities in health

In the 1840s, the German pathologist Rudolf Virchow recognised that "to understand health or illness one must understand the social conditions in which health and illness are created, identified, defined, and continued."[5] The influence of the environment in which people are born, live, work and age on their health was highlighted in numerous studies which attracted wide public attention, such as United Kingdom's Black Report and the global report of the Commission on Social Determinants of Health.[6,7] Higher living standards, or more broadly, a higher relative position within a society's social structure, are associated with better morbidity and mortality outcomes in virtually every context.[8] Socio-economic inequalities in health negatively influence the lives of individuals in lower positions and are detrimental to entire communities and societies.[9,10] Such health inequalities are seen as unfair (and therefore are often explicitly referred to as *inequities*), but not inevitable.

Understanding how socio-economic inequalities in health arise and identifying effective interventions to reduce them is of great importance to all societies. Research has shown that inequalities in health exist whether socio-economic position is measured as absolute access to material resources (such as income, education or wealth), or as a relative position on a social hierarchy (occupational rank, gender- or ethnicity-based differences). The two main theories on the production of socio-economic inequalities in health describe the materialist and psychosocial processes underlying their creation. The materialist theory suggests that a lack of financial resources to afford a healthy living environment and access to health care leads to a higher incidence of disease and worse health outcomes.[11,12] On the other hand, the psychosocial theory proposes that the psychological and physiological effects of stress arising from having a relatively low rank in a social hierarchy have negative impacts on overall health.[13,14] The materialist and psychosocial explanations for inequalities are not mutually exclusive, but are difficult to disentangle.[15] Several other theories attempted to conceptualise the mechanisms leading to socio-economic inequalities in health (for example, social production of health theory or the eco-social theory),[16,17] largely acknowledging the joint importance of both materialist and psychosocial pathways, in addition to the life course impacts of socio-economic deprivation on lifestyle behaviours in general.

I propose an overarching conceptual approach that incorporates several theory-driven pathways and also considers reverse causality and error as possible contributors to socio-economic patterning of health outcomes. The direct causal pathways leading from socio-economic position to health can be categorised into five main streams: 1) lifestyle preferences and behaviours (e.g., smoking, exercise and nutritional intake), 2) health knowledge, 3) environmental hazards, 4) psychosocial stressors, coping mechanisms, social support and self-efficacy, and 5) health access and utilisation, as shown on Figure INT.1.[18-20]

Figure INT.1 Pathways of association between socio-economic position and health outcomes



The net result of these causal pathways on health outcomes is a complex mechanism of lifelong and even intergenerational influences, where the direction and magnitude of each of these pathways may differ at various stages of life, and by context.[21] Some of these pathways may exacerbate and some may mitigate the negative effects of deprivation and lower position on the socio-economic hierarchy. There may be negatively reinforcing feedback loops, whereby for example illness leads to unemployment which results in exacerbating poor health. This inclusive theoretical approach can identify proximal causal pathways and assess their relative importance, but the extensive data requirements (especially longitudinal measurement of exposures and health outcomes) necessary to conduct such decomposition analyses mean that they are only beginning to be possible in high-income countries.[22] Such research has largely concluded that in high-income contexts, alternative explanations for the observed patterns - reverse causality and error - play a negligible role in explaining the observed socio-economic gradients in health outcomes.[19,23-27]

An ecological study of possible drivers of socio-economic inequalities in health observed that societies with good overall levels of health and narrow socio-economic inequalities in mortality (such as Cuba, Jamaica, and the Indian state of Kerala) have three common characteristics: an emphasis on educational attainment, high empowerment of women, and a well-organized primary care system.[28] This observation implicates the interaction of individual knowledge and behaviour with the

available health system as a potentially important determinant for achieving equitable health outcomes. This interaction represents the combination of seeking preventive and curative care and receipt of care from the healthcare system – health access and utilisation. This is one of the direct pathways leading from socio-economic position to health outcomes that can be examined with cross-sectional data currently available for low- and middle-income countries (LMICs). Understanding the pathway leading from socio-economic position to health access/utilisation, which is the focus of this thesis, cannot assess this pathway's relative contribution to the overall socio-economic gradient in health outcomes, because the contribution of the remaining four pathways is not examined. However, the health access and utilisation pathway is one of the few causal pathways directly amenable to relatively rapid change through policy interventions. Assessing how health access and utilisation are socio-economically patterned can provide valuable insights into the type of interventions which might diminish existing socio-economic inequalities in health.

The health access/utilisation pathway contains several interrelated domains which essentially describe an individual's conceptualisation of health and illness and the ways in which the available health services are perceived, accessed, and utilised. In this thesis, I analyse health-seeking behaviour, but the other two components (perception of need and quality of care) are also discussed. As such, the influence of socio-economic position on the numerous steps leading from the acknowledgement of need to the receipt of care and adherence to treatment may differ. For example, availability of finances may be associated with faster receipt of care for childhood illness, while mother's educational level may be associated with adherence to prescribed treatment. However, in order for an exploration of the socio-economic patterns in health access/utilisation to be useful for policy-making, it must consider the social, political and health system context which gave rise to the observed patterns.

I selected Egypt as a context for this thesis's quantitative analysis of health-seeking behaviours.

Three considerations guided the choice of context and health-seeking behaviours for analysis: the link to improved health outcomes, their population levels, and data availability. First, in light of the overall causal framework, health-seeking behaviours for which equitable and universal coverage is desired, ought to be causally linked with health outcomes. The maternal and child health-seeking behaviours analysed in this dissertation were chosen in light of the evidence linking them to improved health

outcomes and global efforts to improve coverage. Second, the type of context most suited to the examination of socio-economic patterning is one with increasing overall levels of health-seeking, but in which these overall levels are neither too low (very few among the target population have the health-seeking behaviour under investigation) nor too high (nearly everyone in the target population has the health-seeking behaviour outcome). Third, data where socio-economic position variables, health-seeking behaviour dimensions, and a range of confounding variables are measured well and with a sufficient sample size, are required. Maternal and child-related health-seeking behaviours in the Egyptian context fulfil these three considerations. Egypt is also an interesting case study for the proposed analysis, because of women's geographic proximity to care providers and a heterogeneous healthcare system that allows for choice from a variety of healthcare providers.

Aims and objectives

The overall aim of this thesis is to assess whether socio-economic inequalities exist in maternal and child health-seeking behaviours in Egypt. This aim is accomplished by developing a conceptual framework to consider the various health-seeking behaviour steps, and applying this framework in analyses to identify the extent and patterns in socio-economic inequalities in these steps. By examining both preventive and curative health-seeking for both maternal and child health conditions, this thesis compares the size of gradients and their drivers in a manner that is relevant for household units, rather than just for individuals. It benefits from having two samples (a nationally-representative survey and a sample of rural poor households) to consider the differences in patterns of health-seeking behaviours, and in the measurement of socio-economic position. The secondary goal of this thesis is to generate informed hypotheses about the most likely causal pathways that underlie the observed inequalities, and consider their research and policy implications.

The main aim is accomplished through the following five objectives:

Objective 1: Review conceptual frameworks for analysing health-seeking behaviour and construct a suitable framework for this thesis.

Objective 2: Synthesise the current understanding of the extent of socio-economic inequalities in maternal and child health-seeking behaviour in Egypt.

Objective 3: Assess how traditional measures of socio-economic position are associated with health-seeking behaviours in a nationally-representative sample in Egypt.

Objective 4: Examine whether these traditional measures of socio-economic position exist among rural poor households and develop context-appropriate measurement of socio-economic position in the sample of rural poor households.

Objective 5: Evaluate the association between the context-appropriate measures of socio-economic position and health-seeking behaviours among the sample of rural poor households in Egypt.

Thesis structure

This thesis follows the book style to provide sufficient methodological detail for the analyses, although several of the chapters have been published as articles in peer-reviewed journals. It is divided into four sections, and further into chapters (Table INT.1).

Section A is divided into three chapters. Chapter 1, reflecting Objective 1, provides an overview of conceptual approaches to analysing health-seeking and presents the conceptual framework used in this thesis. Chapter 2 describes the context of this thesis from two perspectives – the selection of indicators of health-seeking behaviour and Egypt as a country of this case study. Chapter 3 presents a systematic literature review synthesising current knowledge on socio-economic inequalities in health-seeking behaviour in Egypt, which corresponds to Objective 2.

Section B is based on the analysis of the 2008 Egypt Demographic and Health Survey and consists of three chapters: a methods chapter (Chapter 4) and two results chapters on the association between socio-economic position and maternal (Chapter 5) and child (Chapter 6) health-seeking behaviours at the national level, as outlined in Objective 3.

Section C is divided into two chapters. Chapter 7 provides the background of the survey and dataset from Upper Egypt, and addresses Objective 4 by examining whether measurement of socio-economic position in Upper Egypt can be constructed equivalently to the national level. It develops context-appropriate measurement of socio-economic position in the sample of rural poor households. In turn, Chapter 8 evaluates whether these new measures of socio-economic position are associated with maternal health-seeking behaviours in the sample of rural poor households in Egypt (Objective 5).

Section D consists of one chapter (Chapter 9) and presents an overall discussion. This includes an overview of findings, comparisons and strengths and limitations of the analyses. In addition, it concludes the dissertation with recommendations for research and policy.

Table INT.1 Overview of thesis chapters, research questions and methods

Section and chapter	Related objectives	Topics and questions	Methods
Introduction Section A: Chapter 1	**Objective 1** Conceptualisation of health-seeking behaviour in studies of socio-economic inequalities in health. Development of a conceptual framework for this thesis.	- Why are socio-economic inequalities in health an important area of study? What are the causal pathways contributing to worse health outcomes among people with lower socio-economic position? - How can examining health-seeking behaviour aid in understanding the socio-economic patterning of health outcomes? - What is the conceptual approach of this thesis? What are its scope, and its strengths and limitations?	Literature review
Section A: Chapter 2	Background for Objective 2 Selection of maternal and child health-seeking behaviour outcomes. Selection of Egypt as a case study.	- Which health-seeking behaviours were examined in this thesis and how were they defined? - What is the evidence that the selected health-seeking behaviours can contribute to improvement in health outcomes? - Why was Egypt selected for this thesis? - What are the salient characteristics of the health care system in Egypt?	Literature review
Results Section A: Chapter 3	**Objective 2** Synthesis of the current knowledge about socio-economic inequalities in health-seeking behaviour in Egypt via a systematic literature review.	- What quantitative evidence has been generated about the existence of socio-economic gradients in maternal and child health-seeking behaviours in Egypt? - How was socio-economic position measured in these studies? - What health-seeking behaviours were analysed? - What gaps in the understanding of the extent of socio-economic inequalities in maternal and child health-seeking behaviours remain?	Systematic literature review

Section and chapter	Related objectives	Topics and questions	Methods
Section B: Chapter 4	Background for Objective 3 Background of the 2008 Egypt Demographic and Health Survey, methods used in analysis.	Description of dataset used Ethical approval Overview of methods - How were measures capturing socio-economic position constructed?(Latent variable analysis) - How was statistical analysis conducted? o Descriptive analysis o Multivariable analysis – Model building approach o Mediation analysis o Missing data	
Section B: Chapter 5	**Objective 3 (part 1)** Socio-economic inequalities in *maternal* health-seeking behaviours on the DHS.	- What proportions of women sought antenatal and delivery care for the most recent birth in the recall period? - What was the mean price paid for antenatal and delivery care, by provider type? - Were free public antenatal and delivery care effectively targeted to women with lowest socio-economic position? - Were any steps of health-seeking associated with socio-economic position in adjusted analysis? - If so, were such socio-economic inequalities in maternal health-seeking behaviour a result of knowledge-related preferences or differences in access to financial resources?	Descriptive analysis Logistic regression Mediation analysis
Section B: Chapter 6	**Objective 3 (part 2)** Socio-economic inequalities in *child* health-seeking behaviours on the DHS.	- What proportions of children <5 years had diarrhoea or acute respiratory infections in the two weeks preceding the survey? - For what proportions of ill children was care sought? What types of health providers were approached? - Were any steps of health-seeking associated with socio-economic position in adjusted analysis? - If so, were such socio-economic inequalities in child health-seeking behaviour a result of knowledge-related preferences or differences in access to financial resources?	Descriptive analysis Logistic regression Mediation analysis

Section and chapter	Related objectives	Topics and questions	Methods
Section C: Chapter 7	Background of the 2010/11 Survey in Assiut and Sohag governorates in Upper Egypt. **Objective 4** Measurement of socio-economic position in a sample of rural poor households. Methods used in analysis.	Measurement of poverty in Egypt Description of dataset used Ethical approval Overview of methods - Measurement invariance - How were measures capturing socio-economic position constructed?(Latent variable analysis) - How was statistical analysis conducted? o Descriptive analysis o Multivariable analysis – Model building approach o Average adjusted probabilities of outcome o Missing data	
Section C: Chapter 8	**Objective 5** *Maternal* health-seeking behaviours in this sample of rural poor households.	- What proportions of women sought antenatal and delivery care for the most recent birth in the recall period? - Were any steps of health-seeking associated with socio-economic position in adjusted analysis? - Which measures of socio-economic position were associated with health-seeking behaviours and what was the magnitude of the association(s)?	Descriptive analysis Logistic regression Average adjusted probabilities of outcome
Discussion Section D: Chapter 9	Discussion of the main findings, strengths and limitations of this thesis. Recommendations for research and policy. Describe dissemination plan.	- What are the main findings of this thesis? How can the findings of the results chapters be understood comparatively? - What recommendations can this thesis make for improving future research of health-seeking behaviour and socio-economic inequalities in health? - What do the findings of this thesis contribute to policy discussions on improving population-level health outcomes in Egypt? - How will the findings of this research be disseminated?	

1 Conceptual approach and framework

1.1 A review of conceptual approaches to understanding health-seeking behaviour

The first objective of this thesis is to review available conceptual frameworks analysing the relationship between socio-economic characteristics and health-seeking behaviours. A review of literature was conducted to frame the analysis, outlining its potential contributions, and identifying its limitations. Health-seeking behaviour is a relatively recent term to describe the progression of decisions and actions in an individual's illness and sickness behaviour, during which an individual believed (by him/herself or others) to be sick pursues action to seek a remedy.[29,30] Generally, an individual first experiences symptoms (or observes them in another person, for instance a child) and a period of waiting for resolution ensues, possibly incorporating some home-based care and treatment. The occurrence of symptoms may not be a unique or rare event,[31] and approaching a health provider "is not therefore always the immediate solution to uncertainty."[32] The decision to consult a health professional is followed by a choice of one or multiple providers, in a parallel or sequential manner,[33-35] before concluding the negotiation process and deciding to use the prescribed treatment.[32] This process is slightly different for preventive care behaviours such as immunisation uptake, where symptoms do not provide a cue to approach a health provider.

Proposed in the 1950s, the 'health belief model' was one of the first attempts to conceptualise the influence of individual and societal circumstances on attitudes to health-seeking.[36,37] This overarching conceptual theory includes several constructs, such as perception of threat (i.e., need underpinned by susceptibility to, and severity of, potential illness), benefits of action, barriers (direct and indirect costs), self-efficacy, and cues to action, as well as other socio-demographic characteristics. In addition to proposing an approach to identify policy-relevant determinants of health beliefs, another important contribution of this approach was the incorporation of cognitive theory, acknowledging individuals' rational decision-making in the assessment of the value of a particular choice.

Originally, this model aimed to aid in understanding beliefs toward preventive behaviours, such as screening attendance. Its application has since expanded for a

variety of purposes, including curative care-seeking, adherence, and lifestyle behaviours. This approach is intuitively appealing as it can be simplified to four primary drivers of behaviour: need for action, barriers to action, potential benefits of action, and the belief that one can influence the eventual outcome (self-efficacy). A review of 46 studies based on the health belief model by Janz and Becker in 1984 found that among the proposed drivers, barriers to action were the most important determinant in both preventive and curative behaviours. Need for action (perceived threat), on the other hand, was only important in curative behaviour.[38] The authors concluded that the health belief model might be a useful framework for evaluating determinants of health behaviours.

However, applications of this approach had difficulties in operationalising and validating its component constructs, partly due to its focus on attitudes/beliefs rather than the resulting actions and behaviours.[39] Moreover, while the health belief model incorporated elements of individual, familial and community-level socio-demographic context, these factors were not thought to be malleable to policy intervention, and remained marginal to analyses and interpretations. Similarly, Harrison and colleagues drew sceptical conclusions about the predictive validity of this model after analysing 16 studies, all of which incorporated the four primary behaviour drivers.[39] In their quest to validate the theoretical health belief model, these authors made an assumption that the strength and direction of association between the components of the model (including socio-economic) and health behaviours was universal.

The usefulness of the health belief model is not necessarily limited by the lack of generalisability about the associations across various time points, cultures and societies. Each driver requires a separate consideration (a definition as well as association with health behaviour) within differing populations. Overall, the identification of barriers to action as an important consideration in understanding health-related behaviour resulted in increasing attention to the availability, accessibility and quality of care in research. Several disciplinary approaches to health-seeking behaviour have offered diverging and often complementary perspectives on the hypothesised relationship between socio-economic and demographic determinants and behaviours. I consider the economic, anthropological and sociological frameworks here.

First, the economic approach conceptualised health as a stock of human capital.[40] Thus, an individual determines his or her optimal levels of investment in health on the basis of the efficiency of this capital. In the economic approach, decisions about

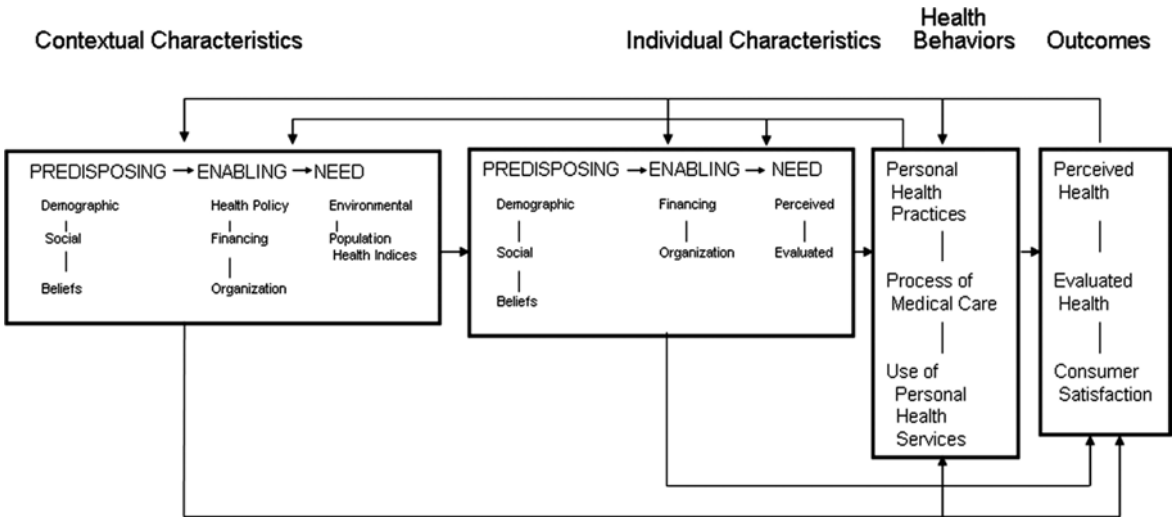
preventive and curative health behaviours would be based primarily on the evaluation of costs and benefits associated with them. Socio-economic position represents the availability of capital resources, and lower socio-economic position may cause lower valuation of future health, thus diminishing the benefits of positive health behaviours.[41] Expanding this model, Ensor and Cooper considered the importance of information, substitute availability, household preferences and community norms, suggesting that individuals with better information and more resources exhibit higher demand for and investment in health.[42] The contribution of the economic approach lies in highlighting the importance of direct and indirect costs of health behaviour relative to its expected benefits. However, differences in financial resources cannot account for the entire variation in the utilisation of care, because the need for care also differs between individuals.[43] In addition, the economic approach may overlook the extent to which demographic determinants, such as gender and age, lead to socio-cultural preferences in health-seeking which are not directly related to need.

Second, the anthropological approach depicted the negotiation between an individual and the socially-constructed medical system, such as described in Kleinman's explanatory framework.[44] One of the strengths of this approach stems from acknowledging that attitudes and behaviours are not constant, but evolve over an individual's lifetime, and particularly with exposure to the healthcare system.[45] Noting that allopathic healthcare may not be the first or indeed the only choice for individuals, this perspective also raises issues of an individual's understanding of disease causation,[46,47] and entitlements in the relationship with a medical provider, who is not neutral, but a representative of a profession, a particular social class, and often also a civil servant.[48,49] One of the unique contributions of the anthropological perspective was to highlight the importance of the power imbalance in the interaction between medical providers and patients.[50-52] Inevitably, such imbalance, and near total control of the provider over the epistemology of illness and disease causation, but also of the means of healing in modern medicine deserves to be considered, because of trust and potential for abuse within the provider-patient relationship.[53,54] However, the anthropological explanatory framework has been criticised for its lack of contextualization and an overly individual focus.[52]

Third, the sociological approach to health-seeking behaviour seeks to identify various levels of influence that contribute to health-related decisions. As outlined in a recent model by Andersen (Figure 1.1),[55] individual and contextual factors, and the characteristics of medical care and previous experience with it, are thought to influence

health-seeking behaviour. The strength of this model stems from incorporation of both material and structural factors,[56] in addition to a feedback loop that encompasses exposure to the health system. The pathways through which socio-economic status is thought to influence health-seeking behaviour include access to material and intellectual resources, such as knowledge and technology.[28] By incorporating contextual influences (e.g., family and community), this model also acknowledges that individuals rarely make health-related decisions in a social vacuum, and that socio-economic position is not solely an individual-level characteristic. However, similar to the economic approach, Andersen's model approached the association between demographic characteristics (age, gender) and health-seeking as unmodifiable. Under the assumption that the influence of socio-demographic characteristics is not amenable to intervention, studies have not found it relevant to explicate why such characteristics predict health-seeking behaviour.

Figure 1.1 Health care utilization model (Andersen, 2008)



In addition to the contributions of the three broad disciplinary approaches (economic, anthropological and sociological) described above, geographic access to health services and the formal organisational setting of healthcare providers were recognised as important determinants of health-seeking behaviour.[57] To summarise the range of disciplinary approaches in studying factors influencing health-seeking behaviours, McKinlay categorised them into six main frameworks: socio-psychological (i.e., health belief model), economic, socio-cultural, socio-demographic, geographic, and organisational/delivery systems approach.[43] More recent theories of health-seeking behaviour include assessments of demand and supply-side interventions of multiple actors, such as the state, international organizations, for-profit organizations and civil

society to improve population health outcomes.[42] The various disciplinary approaches to studying health-seeking are not mutually exclusive, and contribute to the understanding of factors which may prevent or encourage the use of health services. The development of any study's framework must be guided by its distinct research questions and the understanding of the strengths, limitations and data requirements of the available conceptual approaches.

1.2 Seek and ye shall find?: Analysing health-seeking behaviour

The main aim of this thesis is to provide an in-depth understanding of socio-economic patterning of health-seeking behaviour in Egypt using quantitative data. However, a conceptual framework must situate such analysis in an explanatory setting, a broader context, and clarify its scope and its limitations. In addition to health-seeking behaviour (actions to seek care), two other important aspects of the health access/utilisation pathway describe the process leading from socio-economic position to health outcomes: perception of need for care, which precedes any actions to seek care, and the characteristics of care received once a health provider is approached. Both of these aspects are likely to be socio-economically patterned and must therefore be acknowledged in this overarching framework.

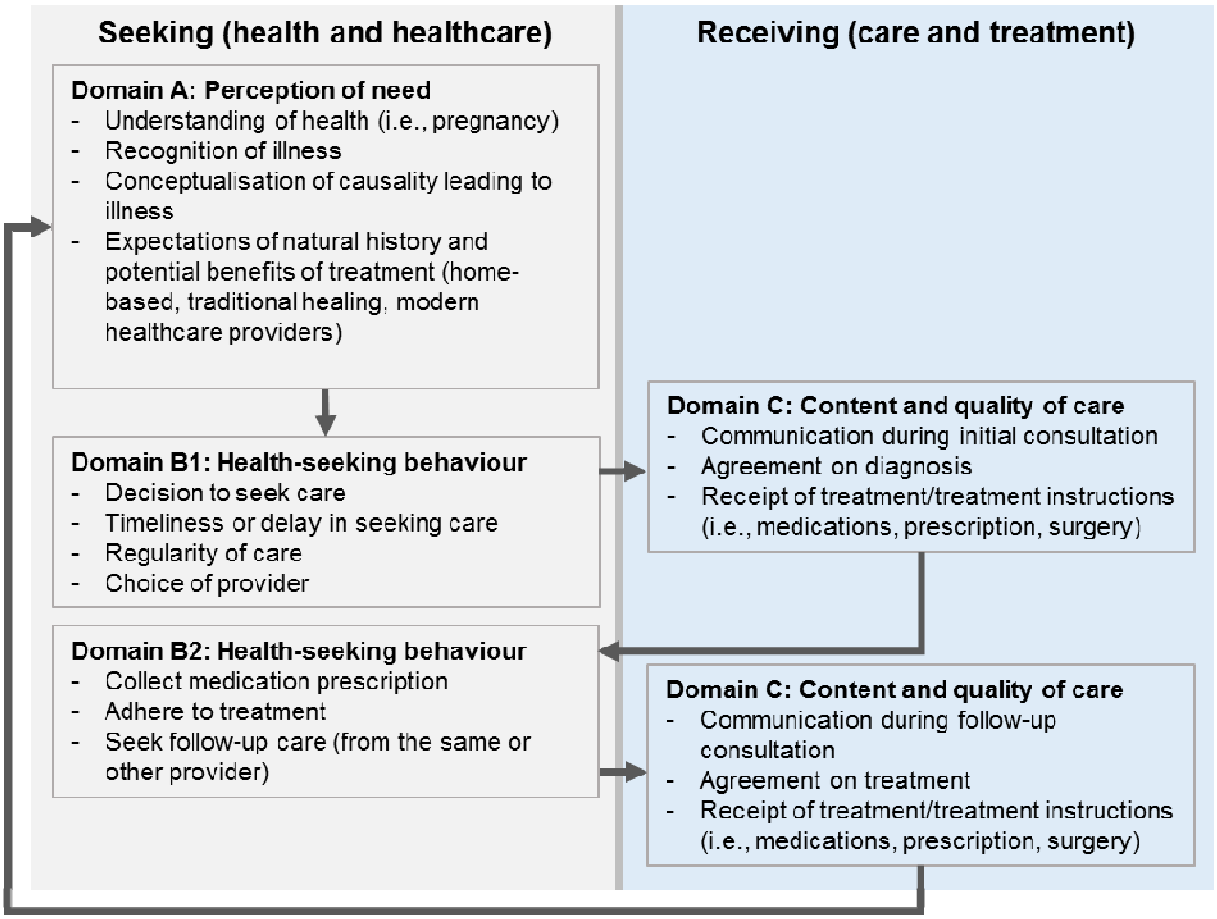
Health and illness are as much social constructions as biological, and the necessity for seeking care and the interaction with care providers is guided by social norms and rules.[29,30,32,58] This is also true for pregnancy, which is variously seen as a normal part of reproduction or a state of heightened vulnerability akin to disease. Further, differentials in content and quality of care could be based on financial affordability (e.g., not purchasing all the prescribed medications), miscommunication, or lack of agreements/rapport with the health care provider about the cause of illness, diagnosis, prognosis and course of treatment, and less dignified treatment for more socio-economically vulnerable patients potentially leading to disrespect and abuse.[4,59,60] In examining the factors associated with maternal mortality, Thaddeus and Maine explicitly included the timely receipt of adequate and appropriate treatment as the third necessary step in the sequence of care-seeking for child delivery.[61] A synthesis of qualitative research showed that perceptions of quality of care, and in particular fear of discrimination and unnecessary medicalisation of childbirth were strong influences on health-seeking behaviours for delivery care in LMICs.[62] While this thesis does not analyse the socio-economic patterning of the perception of the need for care or of the content of received care, its conceptual framework explicitly acknowledges that

individuals' expectations of health-seeking outcomes and their experience with care providers form a feedback loop that may differentially influence the decisions and actions which constitute health-seeking behaviours.

The three broad elements of the health-seeking pathway as conceptualised in this thesis are schematically shown in Figure 1.2. Two dimensions are differentiated in this figure – the dimension of 'seeking' in which the locus of action emanates from the affected individual, and which contains the understanding of health and illness (Domain A: Perception of need) and decisions to approach a care provider (Domain B: Health-seeking behaviour). The second dimension ('receiving care and treatment') captures the characteristics of the care provided by the health provider (Domain C: Content and quality of care). The arrows connecting the three dimensions show the chronological order in which this process takes place in a simple schematic for one health-seeking episode. However, this is a repeated and cyclical process, in which experience and outcomes achieved during previous instances of health-seeking inform one's perception of need and health-seeking behaviour patterns in the future (similar to the feedback loop suggested by Andersen).

The socio-economic patterning of Domains A and C are not examined in this thesis. Qualitative methods may be more suitable for examining the societal, community and individual-level influences that are implicated in socio-economic patterning of perception of need, such as illness aetiology, natural history of illness and expected benefits of treatment, whether traditional or modern (Domain A). The type of study design appropriate for assessing the socio-economic inequalities in the content and quality of care (Domain C) might rely on direct observations of the interaction between care seekers and care providers or on provider records. While the DHS survey used in this thesis collected some data about the elements of maternal and child care obtained by care seekers, the reliability and validity of these individual reports has not been assessed in Egypt. It is possible that the validity of content of care reports is itself socio-economically patterned. Studies from other middle-income contexts have found that individual reports of content of antenatal care carried low specificity, potentially due to social desirability bias.[63]

Figure 1.2 Three domains of the 'Health access and utilisation' pathway



While I do not comprehensively assess the socio-economic inequalities in domains A and C, their existence and importance is acknowledged in the conceptual approach and in the interpretation of results. What I do analyse is the socio-economic patterning of receiving free publicly-provided maternal care and the price paid for care stratified by provider type, and health-seeking for child illness beginning with a consideration for socio-economic inequalities in the perception of ill health. Additionally, the socio-economic patterns of private provider choice in both maternal and child health-seeking may provide valuable clues about the availability, accessibility and preferences for publicly versus privately provided health care.

A finding from rural Tanzania that "the main difference between the poorest children and those who are better off is not in the likelihood of falling ill, but in the probability of obtaining suitable treatment once ill"[64] highlights the need to focus the examination on the socio-economic patterning of health-seeking behaviours. The main consideration in the development of a conceptual approach for this thesis was to describe and understand the socio-economic patterning present in the steps of this

process of seeking care. Such approach allows for two types of questions: 1) *where* in the process of health-seeking do socio-economic inequalities occur, and 2) *which* dimension of socio-economic position drives any such inequalities. Kroeger suggested that the process of decisions and actions inherent in health-seeking – the health-seeking *pathway* – may be more suitable for qualitative analysis.[65,66] On the other hand, the *determinants model,* such as the one proposed by Andersen, might be better suited for quantitative analysis. However, these two approaches can be combined to analyse the determinants of progression through each step on a health-seeking pathway. This hybrid framework, which is applied in this thesis, was previously used by studies analysing the association between socio-economic position and maternal and child health-seeking behaviour.[67-69]

From the broad spectrum of health-seeking behaviours encountered by individuals, only a few are captured by surveys. This thesis focused on four main behaviours, two related to maternal health and two to child health (Table 1.1). First, among women who reported a live birth in the five years preceding the surveys, antenatal care-seeking, including whether care was sought, the choice of provider, the timing of first visit and the regularity of care (number of visits) were examined. The second maternal health outcome was the use of health facilities for delivery care, including the choice of provider. Thirdly, among children <5 years of age, health-seeking behaviours for recent episodes of diarrhoea and acute respiratory infection were analysed. Health-seeking for antenatal care is considered a preventive behaviour, whereas delivery care and health-seeking for child illnesses are broadly approached as curative behaviours. The prevalence of and health-seeking behaviours surrounding child illness were not collected on the Upper Egypt CCT baseline survey (UECCTBS) in the same way as on the DHS, so analysis of child health-seeking was not conducted with this dataset.

Table 1.1 Overview of health-seeking behaviours analysed

Dataset	**DHS (2008)**	**UECCTBS (2010/11)**
Health-seeking behaviour dimensions		
	Maternal: pregnancy and delivery	
1.Sought antenatal care	Yes	Yes
2.Timely antenatal care	Yes	
3.Regular antenatal care	Yes	Yes
4.Private antenatal care	Yes	
5.Delivered in a facility	Yes	Yes
6.Delivered in a private facility	Yes	Yes
	Child: common illnesses	
7.Sought care for diarrhoea	Yes	
8.Timely care	Yes	
9.Care from private provider	Yes	
10.Sought care for acute respiratory infection	Yes	
11.Timely care	Yes	
12.Care from private provider	Yes	

The main aim is to assess whether the various dimensions of health-seeking behaviour were associated with socio-economic position, when adjusted for other factors. This analysis was conducted for each health-seeking behaviour outlined in Table 1.1. It is important to note that timeliness and regularity of behaviours is conditional on seeking care and cannot be assessed among individuals who did not seek any care. This means that socio-economic inequalities can be assessed separately in the subsequent steps, but the interpretation of the findings must take into consideration that any socio-economic patterns in characteristics of care sought are conditional on care having been sought and depend on the socio-economic inequalities present in the preceding behaviour(s). Depending on the existence of socio-economic inequalities in the first step, the socio-economic inequalities in consecutive behaviours might remain the same, be reinforced or attenuated. Additionally, the health-seeking behaviours following the first contact with care providers can be expected to be influenced, directly and indirectly, by the content and quality of care received during the first interaction.

In analyses of each health-seeking behaviour, *a priori* confounders of this association were considered in three groups, the construction of which was based on McKinley's conceptual categories: 1) socio-demographic (e.g., age and gender), 2) experience and health-related factors (e.g., severity of illness, whether pregnancy was wanted), and 3) proxies for the geographic accessibility of care (e.g., region of residence, size of village).

The analysis was guided by three primary hypotheses, which were tested and discussed in the three quantitative results chapters:

1. Socio-economic position was positively associated with seeking any care (dimensions 1, 5, 7 and 10 in Table 1.1).

2. Constructs of socio-economic position which capture knowledge and self-efficacy were associated with characteristics of health-seeking related to seeking timely care (dimensions 2, 8 and 11).

3. Constructs of socio-economic position which capture financial and material resources were associated with characteristics of health-seeking related to seeking regular care (dimension 3) and choice of private providers (dimensions 4, 6, 9 and 12).

To conclude this Chapter, I summarise the conceptual underpinnings of this thesis and present its main contributions and limitations, in light of the datasets and methods used to test the hypotheses outlined above. Conceptually as well as empirically, the positive association between socio-economic position and health outcomes is causal. Health access and utilisation is one of the direct pathways underlying this association. Therefore, its three dimensions (perception of need, health-seeking behaviour and quality/content of care) are potentially causally implicated in the socio-economic patterning of health outcomes. This means that the three dimensions are determined by socio-economic position, and lead to better health outcomes. This causal link is intuitively appealing, and supported by evidence for certain behaviours as well as specific illnesses and conditions.

However, the existence and magnitude of the association between health access/utilisation and health outcomes depends on the particular context, condition and medical interventions under investigation. Many illnesses and conditions for which subjective need for care may be perceived do not result in poorer health outcomes if left untreated. In fact, approaching health providers might be actively discouraged (e.g., seeking a GP consultation for the common cold). In addition, the association between socio-economic position and health-seeking behaviour contains various proximal determinants that may operate differently depending on numerous contextual, socio-political and historical elements, such as the prevalence and depth of poverty, educational achievement, women's empowerment, availability of health providers, and cultural understanding of illness and its treatment. Last, while the causal pathway

between socio-economic position and health access/utilisation may exist, the ability to quantify it greatly depends on the correct specification of the distal and proximal causal factors (i.e., the measurement of the particular influence of socio-economic position, such as income, education, relative deprivation).

The use of observational cross-sectional data and the specific focus on health-seeking behaviours in this thesis did not allow for the overall causal hypothesis to be tested. However, carefully selecting an appropriate context and health-seeking behaviours, and measuring socio-economic position allowed for a rigorous estimation of the association between socio-economic position and various maternal and child health-seeking behaviours. The findings of this thesis can therefore provide unique insights into the broader understanding of socio-economic inequalities in health. The examination of the four health-seeking behaviours in two surveys led to three opportunities to compare the existence and main drivers of socio-economic patterns. These comparisons are discussed in the concluding remarks of Section D, rather than evaluated using formal statistical approaches.

The three secondary hypotheses to guide comparisons of findings were:

1. The strength of the association between socio-economic position and curative health-seeking was smaller than for preventive health-seeking behaviours. This hypothesis was based on the health belief model and the higher relative importance of perceived threat as a driver of curative health-seeking. The presence of inequalities between preventive and curative health-seeking behaviours for maternal care was compared by looking at antenatal versus delivery care.

2. The strength of the association between socio-economic position and curative health-seeking for children was smaller than between socio-economic position and curative maternal health-seeking. This means that in households which experienced both conditions that may initiate curative health-seeking (childbirth and child illness), available resources were preferentially allocated to children. This comparison can be conducted by comparing the DHS-based findings of curative maternal (delivery care) with curative child health-seeking behaviours.

3. The availability of two datasets (a nationally representative survey and a survey of rural poor households) provided an opportunity to compare the levels of

maternal health-seeking in the two samples and the patterns of socio-economic inequalities in these behaviours. Poor households face starker trade-offs between basic expenditures and health-related costs (direct and indirect). I hypothesised that the levels of maternal health-seeking behaviours (the proportion of women seeking antenatal and facility delivery care) on the UECCTBS sample was lower than the nationally-representative population levels captured on the DHS. Additionally, due to the homogeneity of households in Upper Egypt and their absolute poverty, I hypothesised that the extent of inequality in health-seeking behaviours was greater when based on resourcefulness than based on availability of material resources.

The next Chapter discusses the availability, suitability and definition of health-seeking behaviours selected for this thesis. It also describes the context of Egypt's health system and progress in improving maternal and child health indicators to provide a setting for the analysis of socio-economic inequalities in health-seeking.

2 Study context

2.1 Selection of health-seeking behaviour dimensions

The relevance of the health-seeking behaviours selected for this thesis to the larger causal framework linking socio-economic position to health outcomes is reviewed in the first part of this Chapter. In particular, I discuss why the measurement of health-seeking behaviours used in this thesis differs from the global indicators of maternal and child health coverage relevant to the Millennium Development Goals (MDGs). The available data and definitions of health-seeking behaviours in the two surveys is also presented. The levels of these health-seeking behaviours in Egypt, as well as a larger characterisation of Egypt's health system, are presented in the second part of this Chapter.

2.1.1 Maternal health-seeking behaviours

The Millennium Development Goal 5 set out to reduce, by three quarters, the maternal mortality ratio between 1990 and 2015 and to achieve universal access to reproductive health.[70] It has been estimated that maternal mortality – "the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes" has led to 289,000 deaths in 2013.[71] The maternal mortality ratio, or the number of maternal deaths per 100,000 live births, has annually decreased by an average of 2.6% between 1990 and 2013. However, the goal of reducing this ratio globally to less than 100 per 100,000 live births will not be met by 2015. At the current rate of progress, it is estimated that it might take until 2030 to reduce the global maternal mortality ration to under 70 per 100,000.[72]

In addition to deaths, maternal near-miss events and other complications of pregnancy and delivery can result in morbidity and long-term disability leading to devastating physical, psychological and socio-economic sequelae on the lives of women, their children and families.[73-76] The ascertainment of causes of death among women is not without difficulties and the relative importance of the various causes of maternal death varies by country and region, sometimes considerably. The three most recent estimates of the contribution of the major direct and indirect causes of maternal death agree that the vast majority is preventable with timely skilled prevention and intervention during pregnancy and delivery.[77-79] The most recent of these estimates showed that more than half of maternal deaths globally was caused by three main

causes: haemorrhage, hypertensive disorders and infections.[79] Complications from delivery and unsafe abortion contribute to more than 17% of maternal deaths and indirect causes to more than a quarter. Studies have shown that women from poorer quintiles of households are more likely to experience a maternal death than women from richer quintiles (e.g., in Tanzania, Peru and Indonesia).[80]

Antenatal care and skilled delivery care can prevent maternal and perinatal deaths,[81-85] and their coverage has been used to monitor progress toward achieving the goal of reducing the maternal mortality ratio. The role of routine focused antenatal care in monitoring pregnancy is three-fold: prevention of conditions that may have unfavourable effects on the health of the mother and child, their treatment, and provision of information about pregnancy, childbirth and the postnatal period to the mother.[86,87] In developing regions, the United Nations estimated that the proportion of pregnancies for which at least one antenatal care visit by a skilled provider was obtained increased from 63% to 81% between 1990 to 2011.[88] In 54 MDG-target countries assessed by a recent Countdown study on equity, 77.9% of women with a birth had received at least one antenatal care visit with a skilled provider and 49.5% received four or more antenatal care visits during pregnancy. However, women living in the richest wealth quintile of households were 1.9 times more likely to have received any skilled antenatal care and 3.3 times more likely to receive four or more antenatal care visits compared to women from the poorest quintile.[89]

The majority of maternal deaths occur around the time of labour, delivery and the immediate postpartum period.[80,90] Effective interventions exist to prevent, manage and treat virtually all the causes of maternal complications. These interventions include the administration of oxytocics and blood transfusion for haemorrhage, instrumental delivery or caesarean section for obstructed labour, administration of antibiotics to prevent and treat infections, and manual removal of placenta to treat retained placenta.[81] Other interventions that effectively prevent morbidity and mortality that should be routinely administered to all delivering/post-partum women and their newborns include hygienic cord care, post-partum contraception advice, and support with breastfeeding initiation.

One of the strategies for improvement in the survival and health of women and their newborns through the delivery of these interventions is to ensure deliveries are conducted by skilled birth attendants (qualified doctors, nurses or midwives).[91,92] In most LMICs, the most effective method of providing skilled birth attendance is based on

a strategy of having these skilled birth attendants conduct deliveries in primary-level institutions with basic emergency obstetric care capacities, with access to referral-level facilities that have emergency obstetric care signal functions.[81] In contexts where referral to high quality emergency obstetric care is available, home births with skilled birth attendance might also be part of such strategy. The proportion of deliveries attended by skilled birth attendants has increased from 55% in 1990 to 66% in 2011 in developing regions.[88] However, an equity analysis of twelve key maternal, newborn and child health indicators in 54 Countdown counties showed that skilled birth attendance was the most inequitably distributed indicator. Among women with live births, those living in the richest quintile of households were 4.6 times more likely to have delivered with a skilled birth attendant than women from the poorest quintile.[89]

Three main indicators of coverage with antenatal and delivery care were developed to monitor progress toward achievement of MDG5. These were developed in consideration for the availability of data, which for a large proportion of LMICs is based on population surveys such as the Demographic and Health Surveys (DHS, Macro/ICF International) or the Multiple Indicator Cluster Survey (MICS, UNICEF). These indicators are:

1. Antenatal care with a skilled provider,
2. Four or more antenatal care visits during pregnancy, and
3. Delivery with a skilled birth attendant.

The World Health Organization (WHO) defines antenatal care coverage as the "proportion of women attended, at least once during their pregnancy, by skilled health personnel for reasons relating to pregnancy."[93] Skilled health personnel includes doctors, nurses and midwives. The current WHO model recommends a minimum of four antenatal visits during pregnancy in order to deliver the optimal cost-effective content of care (such as clinical examination, blood tests for anaemia, syphilis, HIV, blood type and rhesus factor, estimation of gestational age and uterine height, blood pressure measurement, maternal weight and height, detection and treatment of sexually transmitted infections, urine test, tetanus toxoid, iron/folic acid supplementation, discussion of a birth plan, and contact information for emergencies). While most DHS questionnaires collect up to ten elements of antenatal care content, these self-reports from women are not used in estimates of antenatal care coverage.

The indicator capturing attendance of four antenatal care visits is based on the guidelines that suggest all the basic antenatal care interventions can be delivered

during four visits,[94,95] and that a woman's chances of receiving the recommended interventions is higher if she attends four or more compared to fewer visits. Therefore, the receipt of four or more antenatal care visits is used as an additional indicator or antenatal care coverage.[96] The location of antenatal care (i.e., home-based or facility-based) is collected in surveys but not included in the antenatal care coverage indicators, despite evidence that quality of care provided in home-based antenatal care is significantly lower than in health facilities.[97]

Birth with a skilled birth attendant is measured as the proportion of all live births in a specific time period that was attended by skilled health personnel (doctors, nurses or midwives, trained in providing lifesaving obstetric care).[96] Similarly to antenatal care, in LMICs the data from which this indicator is calculated is primarily based on women's self-reports of the person who attended their deliveries. This indicator does not capture the environment/location of the delivery (i.e., home-based versus institutional, or the level of health facility such as dispensary, clinic or hospital), although the ability of a skilled delivery attendant to manage uncomplicated deliveries and identify, manage, and refer complications in women and newborns depends on the equipment and emergency obstetric care capabilities of the environment (such as those measured in facility signal function assessments).[98]

The ability of women to correctly ascertain and recall the professional qualification level of the delivery attendant(s) who assisted their delivery has been raised as a potential issue.[99] Country datasets from which this coverage indicator is calculated provide no information about the qualifications, training and accreditation of the delivery attendants listed in the numerous response options, which can vary significantly across countries.[100] Lastly, for both antenatal care and delivery attendance, more than one response option can be selected when choosing the type of care provider, and the most highly skilled among those listed is used in calculating the coverage indicators. However, the potentially varying roles of the person with the highest qualification and their presence/availability during care provision (direct provider, supervisory/managerial role, training post etc.) is not captured and therefore not considered in the definition.

In summary, none of the three maternal care coverage indicators was suitable for analysis of health-seeking behaviour as conceptualised in this thesis. The two antenatal care indicators capture the health-seeking behaviours and characteristics of care (skilled attendant) or several health-seeking behaviour dimensions (any care and frequency of care). Moreover, because the provider skill is not captured by the "four or

more antenatal visits" indicator, women for whom the number of antenatal visits is estimated are not a subset of women who received any antenatal care with a skilled provider. This results in a residual category of women who received four or more antenatal care visits from an unskilled provider, but who are not considered to have received antenatal care from a skilled provider. The difference between the proportion of women who received antenatal care with a skilled provider and the proportion of women who received four or more antenatal care visits therefore does not reflect insufficient number of visits among women who received skilled antenatal care, as might be expected. While the two measurements are highly correlated, conceptually they capture different dimensions, and the extent of such correlation is likely to be highly dependent on context-specific issues surrounding the content of antenatal care and validity of women's recall of provider's skill level.

The measurement of the skill level of the birth attendant is subject to some important limitations. However, the combination of health-seeking and characteristics of care within this indicator may capture progress towards universal coverage of skilled attendance at delivery as outlined in MDG5. Based on the evidence of their impact on maternal and neonatal health and survival, it is understandable that this indicator attempts to capture the dimensions of seeking and the receipt of skilled care, and is also referred to as "service contact".[101] However, similarly to antenatal care coverage indicators, this combination of health-seeking and characteristics of care received makes it impossible, without the use of the raw datasets, to ascertain whether any potential improvement in coverage and equity of delivery with a skilled birth attendant was a result of increasing health-seeking behaviour, improvements in content of care, or both.

For the purpose of this thesis, I aimed to capture solely indicators of health-seeking for maternal care. I constructed four measures describing antenatal care and two measures for delivery care. All measures are binary and can therefore be expressed as proportions of the population (i.e., population coverage). The details of the definitions for both datasets are provided in Table 2.1. The recall period for inclusion in the denominator is the same for antenatal and delivery care (five years). Indicators of both antenatal and delivery care consider the most recent live birth in the recall period.

Any antenatal care is defined as seeking any provider during pregnancy for the purposes of a prenatal consultation. Among women who sought antenatal care, its timeliness, regularity and private provision was assessed. Timely antenatal care was

defined as seeking the first antenatal care visit during the first trimester of pregnancy. Regular antenatal care was defined as seeking four or more antenatal care visits, regardless of the type of facility, mix of provider types, professional delivering care, or care content. Last, if any of the providers operated in the private sector, the woman was characterised as seeking private antenatal care.

The discussion whether the proxy indicator for safe deliveries should be based on the presence of a skilled birth attendant or institutional delivery in LMICs is largely theoretical - estimates from dozens of countries show that these are so highly correlated as to be nearly identical. The vast majority of births with a skilled birth attendant occurs in facilities[102] and nearly all deliveries in health facilities are with a skilled birth attendant.[103] However, the conceptual approach in this thesis requires an indicator that measures health-seeking behaviour rather than content of care, and the choice of delivery location (facility versus home, and public facility versus private facility) meets this criterion. A woman delivering at home who sought the attendance of a skilled provider is different from a woman who chose to deliver in a facility, where fewer opportunities for choice of attendant can be exercised. First, I assessed whether the delivery occurred in a health facility or not, regardless of the content or quality of such care (e.g., the type and skill level of the delivery attendant). Second, if the birth occurred in a health facility, the sector (private or not) of the provider was captured.

Table 2.1 Definition of maternal health-seeking behaviours, by dataset

	DHS (2008)	UECCTBS (2010/11)
Antenatal care		
Recall period	*5 years*	*5 years*
Sought any antenatal care		
Numerator	Number of women 15-49 who reported seeking any facility-based antenatal care for the most recent live birth in the recall period.	
Denominator	Number of women 15-49 years old with one or more live births in recall period.	
Timely antenatal care		
Numerator	Number of women 15-49 who reported seeking the first antenatal care visit during the first trimester of pregnancy (month 1-3) for their most recent live birth in the recall period.	Not available
Denominator	Number of women 15-49 years old with one or more live births in recall period who used any antenatal care during pregnancy preceding the most recent live birth.	
Regular antenatal care		
Numerator	Number of women 15-49 who reported seeking four or more antenatal care visits during the pregnancy preceding their most recent live birth in the recall period.	
Denominator	Number of women 15-49 years old with one or more live births in recall period who used any antenatal care during the pregnancy preceding the most recent live birth.	
Sought antenatal care from a private provider		
Numerator	Number of women 15-49 who sought antenatal care from a private (non-public) provider for their most recent live birth in the recall period.	Not available
Denominator	Number of women 15-49 years old with one or more live births in recall period who used any antenatal care during pregnancy preceding the most recent live birth.	
Delivery care		
Recall period	*5 years*	*5 years*
Delivered in a health facility		
Numerator	Number of women 15-49 who delivered their most recent live birth in the recall period in a health facility.	
Denominator	Number of women 15-49 years old with one or more live births in recall period.	
Sought delivery care from a private provider		
Numerator	Number of women 15-49 who delivered their most recent live birth in the recall period in a private health facility.	
Denominator	Number of women 15-49 years old with one or more live births in recall period who delivered the most recent live birth in a health facility.	

2.1.2 Child health-seeking behaviours

Millennium Development Goal 4A called for a reduction by two-thirds, between 1990 and 2015, in the mortality rate of children <5 years of age. The <5 mortality rate is defined as "the probability that a child born in a specific year or time period will die before reaching the age of five, if subject to current age-specific mortality rates (expressed as a rate per 1,000 live births: number of deaths of children less than five years of age per 1,000 live births)."[104] Between 1990 and 2011, the <5 mortality rate declined by 41%, to a level of 51 per 1,000 live births and this decline had occurred at an average annual rate of 2.5%. However, 6.9 million children were estimated to have died in 2011, largely due to preventable and treatable conditions and illnesses.[88]

The mortality rate among newborns up to four weeks of age (neonatal mortality rate) has declined at a slower rate than mortality among children 29 days to 5 years of age. Therefore, neonatal mortality currently contributes a larger proportion of all deaths <5 years (43% in 2011) than it used to in 1990 (36%).[88] Estimates from 186 countries showed that more than 70% of neonatal deaths occurred within the first week of life,[105] and the interventions to prevent these early neonatal deaths are closely linked to antenatal care, skilled birth attendance, emergency obstetric care, and exclusive breastfeeding.[106,107] An analysis of socio-economic inequality in neonatal mortality in 24 LMICs showed that in most of the included countries, gradients in neonatal survival had not widened during the first decade of 2000.[108]

Slightly more than half of all deaths <5 years currently occur in the post-neonatal (29 to 364 days of life) and childhood (1-4 years) periods. Globally, the mortality rate for both periods is approximately equal, 13 per 1,000 live births in 2013.[109] The leading causes of death in children <5 who survive the neonatal period include pneumonia, diarrhoea, malaria, and malnutrition,[110] and the vast majority of these deaths are preventable.[111] Due to incomplete vital registration in most LMICs, models based on population surveys were used to estimate that 4.5 million children aged 1-59 months died in 2010 and more than 1.8 million (40%) of these deaths were due to pneumonia or diarrhoea.[112] While the mortality rates, their causes and time trends differed substantially between countries and across regions, socio-economic inequalities in <5 mortality rates existed in virtually all LMICs.[113] If the <5 mortality rate among children from the poorest 60% of households was brought to the levels among children in the richest 40%, 33% of all <5 deaths (3.5 million) could have been averted in 2000.[113]

In order to track progress toward MDG4 and MDG5, over 20 coverage indicators have been outlined and monitored by the Countdown to 2015 for Maternal, Newborn and Child Survival. Among the indicators that relate to newborns and children <5 are: receipt of delivery with a skilled birth attendant, postnatal care, early initiation of breastfeeding, timely introduction of solid/semi-solid and soft foods, immunisation (diphtheria-tetanus-pertussis, measles and haemophilus influenza type b), vitamin A supplementation, malaria prevention and treatment, and treatment for pneumonia and diarrhoea.[101,114] In this thesis, I focused on child health-seeking behaviours related to pneumonia and diarrhoea. Indicators related to antenatal and intrapartum care are analysed among maternal health-seeking behaviours. None of the remaining indicators were suitable for analysis of health-seeking behaviour (initiation of breastfeeding does not require contact with the health system for the vast majority of women and their newborns), or for the context of Egypt (Egypt is not a malaria endemic country and Egypt's coverage of essential childhood immunisation reached near universal levels - >90% in 2008).[115]

Pneumonia was the largest single cause of death among children in the post-neonatal period during the 2000-2015 MDG period, accounting for nearly 1.5 million deaths in 2010.[112,116] Incidence of pneumonia in LMICs was estimated at 0.29 episodes per child-year,[117] case fatality ratios can reach 1.3% - 2.6%, and 8.7% of episodes are severe enough to be life-threatening and to require in-patient care.[118] The relative importance of the causes of childhood pneumonia varies by setting. In LMICs, the main bacterial causes of clinical pneumonia are *Streptococcus pneumoniae*, *Haemophilus influenzae*, *Staphylococcus aureus* and *Klebsiella pneumonia.*[117] In addition, a substantial proportion of pneumonia or bronchiolitis cases in children may be caused or precipitated by viruses, such as respiratory syncytial virus, influenza A and B, and parainfluenza.[119] A comprehensive approach to reducing the morbidity and mortality from pneumonia is based on three approaches – protection (environmental and nutritional risk factors), prevention (immunisation, zinc supplementation, and prevention in HIV-positive children), and appropriate treatment with antibiotics.[120,121]

To estimate the prevalence of pneumonia and assess subsequent health-seeking and treatment, population-based surveys use a structured sequence of questions eliciting the presence of various respiratory symptoms from the child's primary caretaker. On MICS and DHS surveys, the combination of symptoms potentially indicative of pneumonia is referred to as "suspected pneumonia", "presumed pneumonia" or "acute respiratory infection" (ARI), and is defined as cough accompanied by breathing which is

faster than usual with short, quick breaths, or by difficulty breathing (which is not only due to a blocked nose).[122] In this thesis, I used the acronym ARI to capture this combination of symptoms.

Diarrhoea is defined by the World Health Organization as “the passage of three or more loose or liquid stools per day,” and is usually a symptom of bacterial, viral and/or parasitic infection of the intestinal tract, where the presence of blood in stool can be a symptom of dysentery.[123] Diarrhoea was estimated to be the second most important cause of death among children in the post-neonatal period, responsible for 750,000 deaths in 2010.[112] Globally, the incidence of diarrhoea was estimated at 3.4 episodes per year per child in 1990 (uncertainty interval 2.9-3.9) and at 2.9 in 2010 (uncertainty interval 2.3-3.4).[124] Seasonal fluctuations in diarrhoea incidence can be substantial.[125] Improved water, sanitation access, and hygienic practices are the key factors for avoiding diarrhoea among children. The most acute consequence of diarrhoea is severe dehydration, where water and electrolytes are lost through liquid stools and not replaced. Other consequences of untreated diarrhoea include malnutrition and increased susceptibility to diarrhoeal disease. The treatment of diarrhoea includes prevention or treatment of dehydration with oral rehydration salts (ORS) solution or intravenous fluids, zinc supplementation, and continued feeding (including breastfeeding).[126,127] ORS can be made and administered at home, but seeking a health provider is recommended for children who have persistent diarrhoea (>14 days), blood in the stool, or show signs of dehydration.[122,123]

Globally, the reduction in deaths from pneumonia and diarrhoea has saved more than 800,000 lives between 2000 and 2010.[112] However, in an assessment of 54 LMICs, on average only 40.1% of children with diarrhoea received ORS and only 48.0% of children with suspected pneumonia were taken to a health provider - some of the lowest coverage levels among the 12 indicators assessed. Children from the richest quintile of households were 1.4 times more likely to receive ORS for diarrhoea and 1.8 times more likely to be taken to a health provider with suspected pneumonia than children from the poorest quintile.[89] An in-depth and context-specific understanding of socio-economic determinants of health-seeking behaviours is therefore crucial to ensuring further decreases in the <5 mortality attributable to these two illnesses.

Three indicators are currently used to monitor the coverage of interventions which should be received by all children with these illnesses:[96]

1. Children aged <5 years with ARI symptoms taken to a health facility,
2. Children <5 years with ARI symptoms receiving antibiotics, and
3. Children aged <5 years with diarrhoea receiving oral rehydration therapy.

The first indicator captures the proportion of children <5 years of age with ARI in the two weeks preceding the survey who were taken to an appropriate healthcare provider. The Indicator Compendium document does not provide a definition of an "appropriate healthcare provider." The second indicator aims to capture whether children with ARI received treatment with antibiotics. However, it is not clear whether this indicator only applies to children who were taken to a care provider (i.e., a subset of children from the first indicator) or to all children with ARI. The latter case would include instances of home treatment with antibiotics which were not necessarily prescribed by a health provider. Such behaviour might signal re-using antibiotic prescriptions among household members or over-the-counter purchase of medication, both of which are undesirable. Third, the indicator of diarrhoea prevention and treatment captures the proportion of children <5 with diarrhoea in the two-week recall period that were treated with packaged oral rehydration salts or an appropriate home-made sugar-salt-water solution. This definition clearly captures both facility-based and home-made treatments and does not require a contact between the child (or child's caretaker) and a health provider.[96]

These indicators of progress toward MDG4A related to childhood pneumonia and diarrhoea capture three different combinations of the three domains of the 'health access and utilisation' pathway. The first indicator combines perception of illness with health-seeking; the second indicator combines perception, health-seeking and content of care, whereas the third indicator joins perception of illness with content of care. These differences in the measurement of indicators result in only indicator 1 being suitable for analysis of health-seeking behaviour in this thesis, with additional clarification required about providers that are appropriate. Indicator 2 has been criticised in contexts with low prevalence of pneumonia, where even high sensitivity and specificity (>90%) of caregiver reports of ARI result in a large proportion of identified cases being false positives. Sensitivity and specificity of suspected pneumonia are in reality substantially lower (<70% in Bangladesh and Pakistan, for instance).[128] Therefore, while this indicator might not be suitable for calculating

coverage of ARI with antibiotic treatment, it is valid for assessing health-seeking, as all children with ARI-like symptoms should be evaluated by a health care provider.[129]

Similar issues exist in capturing data on severity and treatment of diarrhoea. In reports of child diarrhoea, information about additional symptoms (e.g., fever, vomiting), duration (>14 days), and behaviours (e.g., drinking more than usual) could be useful to distinguish diarrhoeal episode severity.[130] These could be used to consider whether simple home-based treatment was sufficient or whether attention of a health provider was more appropriate. However, other than the presence of blood in the stool, no other symptoms or co-morbidities were captured on the 2008 Egypt DHS survey. The preparation and administration of ORS at home, for prevention and treatment of dehydration, is feasible and encouraged. However, the ability of current DHS questionnaires to capture ORS provided at home is questionable, due to issues in defining and translating the terms into local languages, ability to differentiate any fluids from ORS, and ascertaining whether ORS was provided to prevent or treat dehydration.[130] The provision or prescription of ORS by a health provider is considered a measure of content or care, rather than of health-seeking behaviour.

For the purpose of this thesis, I constructed three measures capturing health-seeking behaviours for both diarrhoea and ARI. All measures are binary and the details of their calculation are provided in Table 2.2. The recall period for estimating period prevalence of both illnesses on the DHS was two weeks. There is a suggestion that a recall period of up to one month carries similar sensitivity/specificity levels for reporting of ARI.[129] However, the validity of diarrhoea reporting is affected by longer recall periods, and even the two-week period may underestimate prevalence.[131] Broadly, the duration of these illnesses is estimated to be one week,[129,131] and therefore the two-week recall period captures period prevalence of illness during up to three weeks preceding the day of the survey. Seeking any care for diarrhoea or ARI was defined as seeking any health provider among children whose caretaker reported an illness, and did not capture content of care or treatment received. While seeking care from a health provider may not be necessary for every child with an episode of diarrhoea, this indicator measured health-seeking equivalently to the health-seeking for ARI care. Among children for whom any care was sought, its timeliness and private provision was assessed. Timely care was defined as seeking care within one day of illness onset. Seeking private care was defined as having approached any non-public provider of care.

Table 2.2 Definition of child health-seeking behaviours, by dataset

	DHS (2008)	UECCTBS (2010/11)
Care for diarrhoea		Not available
Recall period	*2 weeks*	
Sought any care		
Numerator	Number of children <5 years with diarrhoea who were taken to a health provider.	
Denominator	Number of children <5 years who had diarrhoea during the recall period.	
Sought timely care		
Numerator	Number of children <5 years with diarrhoea who were taken to a health provider within one day of illness onset.	
Denominator	Number of children <5 years with diarrhoea who were taken to a health provider.	
Sought private care		
Numerator	Number of children <5 years with diarrhoea who were taken to a private health provider.	
Denominator	Number of children <5 years with diarrhoea who were taken to a health provider.	
Care for acute respiratory infection (ARI)		Not available
Recall period	*2 weeks*	
Sought any care		
Numerator	Number of children <5 years with ARI who were taken to a health provider.	
Denominator	Number of children <5 years who had ARI during the recall period.	
Sought timely care		
Numerator	Number of children <5 years with ARI who were taken to a health provider within one day of illness onset.	
Denominator	Number of children <5 years with ARI who were taken to a health provider.	
Sought private care		
Numerator	Number of children <5 years with ARI who were taken to a private health provider.	
Denominator	Number of children <5 years with ARI who were taken to a health provider.	

To summarise, current indicators of maternal and child care used for MDG progress monitoring combine health-seeking behaviour and content of care, or several dimensions of health-seeking. For the use in this thesis, I developed definitions of health-seeking behaviours which excluded content and quality of care and separated the various elements of health-seeking (timeliness, regularity, private care). However, as shown in the conceptual framework, all health-seeking is preceded by perception of need for care. Therefore, the health-seeking behaviours as defined in this thesis inadvertently also captured Domain A in Figure 1.2. If an association between socio-economic position and perception of need for care truly existed, the assessment of socio-economic inequalities in health-seeking will also capture such inequalities. It is not possible, without additional information, to partition the effect of socio-economic position on perception of need from its effect on health-seeking behaviours. It is possible that some socio-economic patterning exists in the recall of pregnancy, early ascertainment of pregnancy, and women's perception of need for early antenatal care. However, the socio-economic patterning in perception of childhood illness and need for curative care is more of a concern to the analyses in this thesis.

For this reason, I began the analysis of health-seeking for children's curative care with an examination of socio-economic gradients in reporting illness. However, even this approach cannot partition the likely higher exposure to risk factors for illnesses among children living in households of lower socio-economic position (for example, indoor air pollution, crowding, malnutrition, water/sanitation facilities, and hygienic practices) from socio-economic differences in understanding of illness causation and perception of need for care. In other words, the period prevalence of child illness may be truly higher among children from lower socio-economic circumstances, but the prevalence might be underestimated on a survey if child illness is more common among families of lower socio-economic position and thus considered normal or not requiring treatment. Despite this limitation, examining inequalities in illness reporting is a useful start for the analysis of health-seeking behaviours for curative care of children. Additionally, for both maternal and child health-seeking behaviours, the analysis of predictors of timely seeking of care might be useful to the assessment of delay not only in seeking care, but also delay in recognition of pregnancy and childhood illness.

2.2 Egypt is an excellent context for examining socio-economic inequalities in health-seeking behaviours

This section describes the socio-demographic context and health system in Egypt and recent trends in maternal and child health. It concludes by highlighting the reasons why Egypt is a good case study for assessing socio-economic inequalities in health-seeking behaviours in general, and maternal and child-related health-seeking behaviours in particular.

Located in the eastern Mediterranean, Egypt is the most populous Arab country, with 78 million inhabitants in 2010.[132] Egypt is historically and administratively divided into Lower Egypt (the Nile Delta north of Cairo), several metropolitan urban centres (Alexandria, Cairo, Suez, Port Said), Upper Egypt (south of Cairo), and Frontier regions, such as the Sinai peninsula (Figure 2.1). Each of Egypt's 27 governorates is further subdivided into centers (sing. *markez*) in rural and into districts (sing. *kism*) in urban areas. Egypt recently registered economic growth of approximately 5% per annum,[133] with gross domestic product of $10,685 PPP$ per capita in 2012.[134] It is classified as a lower middle-income country by the World Bank.

Egypt's population is concentrated along the banks and the Nile delta and 43% are urban.[135] The population is young; in 2010, 11.4% was estimated to be 0-4 years of age and 31.5% was below 15 years.[132] The annual population growth had been gradually declining from 2.28% in the early 1980s to 1.68% in the period between 2000-2005.[132] However, the total fertility rate in the most recent estimates increased from 3.0 in 2008 to 3.5 in 2014.[136] The crude birth rate was 23.5 per 1,000 people and crude death rate 6.5 per 1,000 in 2012.[135] Life expectancy at birth was estimated at 73.5 and 68.7 years for females and males in 2010-2015, respectively.[137] In 2010, ischaemic heart disease, stroke and cirrhosis were the leading causes of premature mortality in Egypt, together accounting for a third of years-of-life-lost due to premature death.[138]

Literacy among adults (15 years and older) has improved steadily from 44% in 1990 to 72% in 2010. This rate remains suboptimal and lags significantly among females compared to males (63.5% v 80.3% in 2010). However, literacy rates are higher among the young people aged 15-24, at 88% in 2010.[139] The agricultural and industrial sectors are the two largest sources of employment, accounting for 28.2% and 25.3% of employment in 2010, respectively. The overall unemployment rate reached 12.7% of

the labour force in 2012, with low female labour force participation (23.6% in 2012), and substantial proportion of employment informal.[137]

Figure 2.1 Map of Egypt

Source: Egypt Demographic and Health Survey 2008 report.

2.2.1 Health system

Egypt's modern healthcare system developed from a publicly funded and provided system, based on the right to free care enshrined in the 1952 constitution. The public health system contributed to a wide availability of basic health services and as a result, national health indicators registered a steady improvement over the intervening decades. Life expectancy at birth increased from 46 in 1960 to 73 in 2010. By 2010, the percent of population with physical access to primary health facilities, defined as living within 5 km or 1 hour away from the nearest facility, reached 95%.[140] At the same time, population growth, longer life span, double burden of infectious and non-communicable diseases characteristic of a country in demographic transition, and inattention to the public health system have put the existing resources under significant pressure.

The financing of health services in Egypt is fragmented and difficult to navigate. Dozens of governmental and private entities are involved and the Ministry of Health and Population (MOHP) is not in a dominant financing position.[141] Overall, expenditures on health amounted to 4.9% of the GDP in 2011, but a high proportion of this financing (58.2%) is from private out-of–pocket payments.[134,142] The Health Insurance Organisation (HIO), established in 1964 and funded from premiums and co-payments, covers several types of beneficiaries, such as civil servants, pensioners, widows, children <5 years, school-age children and students.[140] The HIO also provides health services through a network of hospitals, GP clinics, school health clinics, specialist clinics, and pharmacies. Private health insurance exists, but its coverage is extremely limited. In 2008, it was estimated that 27.6% of the population was covered by some form of public or private health insurance.[115]

Egypt has a high availability of health care professionals. During the period between 2000 and 2005, Egypt had 24 physicians and 34 nurses/midwives per 10,000 population; both are more than double the density for the lower middle income group of countries as a whole.[143] The MOHP is a major provider of primary, preventive and curative care, and has an oversight responsibility (but limited authority and capacity) to regulate private providers. It operates through a hierarchical structure with a centre in Cairo, and governorate-, district- and health provider-levels to run services at the various health facilities, such as rural and urban primary health care units, health centres, hospitals, and maternal and child health centres.[140,144] Since the economic liberalisation policies of the mid-1970s, the role of privately provided healthcare had

increased substantially. A broad spectrum of modern and traditional health providers operate in Egypt, ranging from governmental, parastatal, university (such as teaching hospitals), military, for-profit, non-governmental organizations (NGOs), and traditional practitioners, with varying quality and cost.[140,145,146] Physicians are permitted to work simultaneously in both public and private sectors. A survey of physicians from 1997 showed that 89% had more than one job, and 16% had three or more.[144]

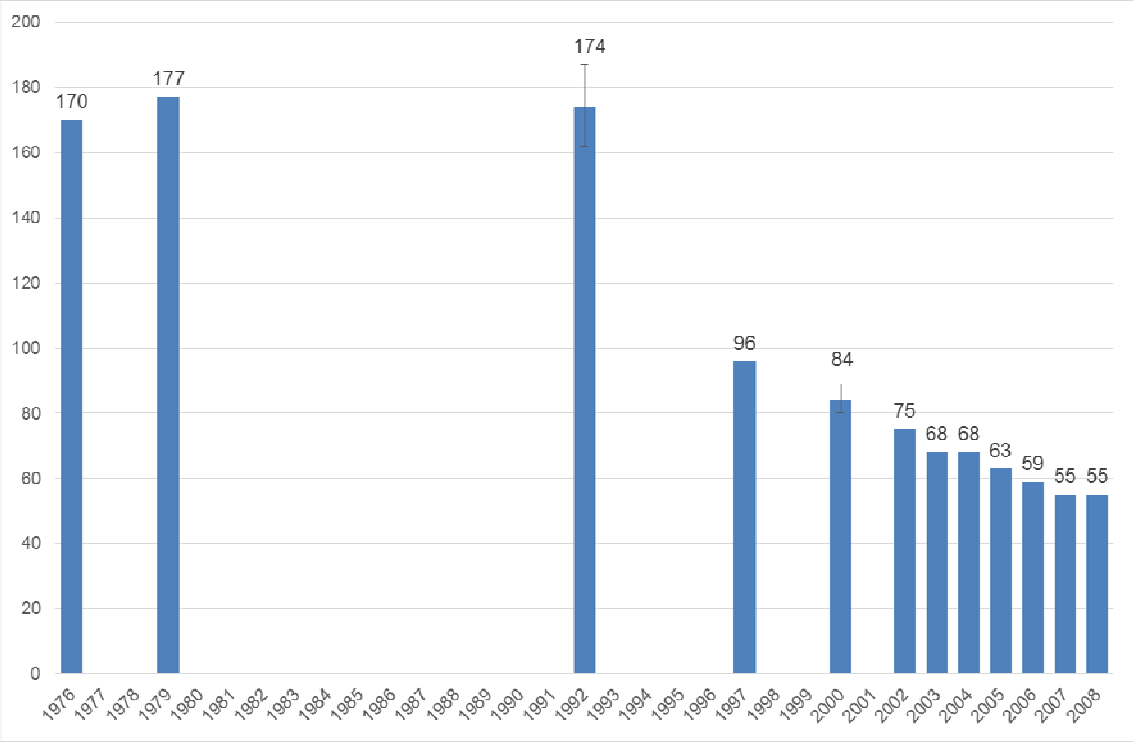
Currently, the majority of outpatient services are sought from private and the majority of inpatient services from public providers.[147,148] A study from 2009/10 estimated that the average annual expenditure on health was 646 Egyptian pounds (EGP) per capita, 47% of which was spent on acute outpatient services.[149] Unsurprisingly, this study also showed that the burden of out-of-pocket health expenditures on health was heaviest for households in the lowest income quintile, where these expenses represented more than a fifth of household income.[149] Improvements in health among the substantial proportion of the population living below the poverty line or in rural areas have lagged behind the rest of the population as a result of the fragmentation of health care providers, lack of universal insurance coverage, and concerns about the quality of publically provided services. [150] In the following paragraphs, I examine some basic indicators of maternal and child health, and when possible, discuss their socio-economic patterns.

2.2.2 Maternal health

Following considerable attention to provision of services and measurement of maternal mortality in Egypt, the maternal mortality ratio decreased between 1992 and 2000 from 174 per 100,000 live births to less than half at 84 per 100,000 (Figure 2.2).[151] This improvement was achieved through various interventions, such as increase in utilisation of care, provider training, introduction of standards of care, facility upgrades and public awareness campaigns. Some of these interventions were specifically targeted to maternal services, and some were wider programmes aimed at the health system as a whole. Female education levels and the modern contraceptive prevalence rate, both of which are linked to better reproductive and maternal health outcomes, also increased during this time period.[152] In 2000, the three most frequent causes of maternal death were haemorrhage (30%), hypertensive disease (13%), and sepsis (8%). Substandard care by obstetricians, absence or poor quality antenatal care, and delays in recognising problems and seeking care were identified as the most important

avoidable causes of maternal death. Distance and lack of transport were only infrequently identified as avoidable factors for maternal death.[151]

Figure 2.2 Maternal mortality ratio estimates (per 100,000 live births) in Egypt



Source: Various sources listed in Campbell et al 2010.[153]

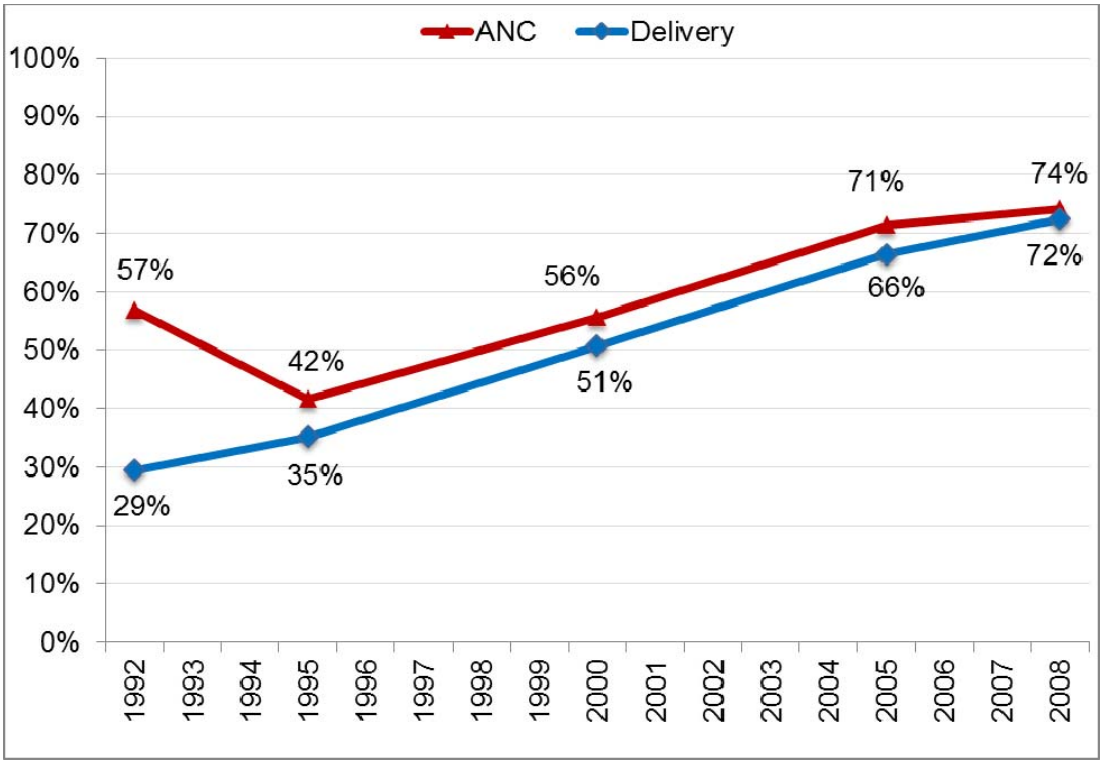
Perceptions of need for care, health-seeking behaviours and content/quality of care are inherently linked to these avoidable factors. The choice of delivery location determines whether a skilled birth attendant is available during labour, delivery, and the immediate postpartum period. There has been a substantial increase in the proportion of births attended by skilled professionals in Egypt, from 41% in 1992 to 79% in 2008.[115,154] However, perceptions of need for care, quality of care, and financial implications of these choices may drive the selection of delivery facility and attendant, and therefore the capacity to deal with obstetric emergencies and appropriate referrals.[153,155,156] Delays in recognising and seeking care by women may be linked to lack of autonomy, decision-making, or to lack of information about signs of complications. Antenatal care coverage and content is of particular importance in communicating information about complications of pregnancy and delivery, and discussing birth preparedness in general. However, only 34% of women who received antenatal care reported receiving information about signs of complications in 2008.[115]

The percentage of most recent births in the five-year recall period for which women sought facility-based antenatal care increased from 42% in 1995 to 74% in 2008 (Figure 2.3). The definition of an antenatal care visit and the collection of this information changed between the 1992 and 1995 surveys, and these data points are therefore not comparable.[157] A similar trend is seen for the percentage of births delivered in health facilities, which rose from 29% in 1992 to 72% in 2008. The two reasons most often cited by women for not delivering in a health facility were that this was not customary (63% of women who delivered in domestic environments) and concerns for price of care (23%).[115] However, whereas the use of private providers for antenatal care was relatively high in both time periods (76%), the use of private facilities for delivery care increased dramatically from 39% in 1992 to 63% in 2008.

In 2008, geographic differences in proportions of women seeking any antenatal care were wide, ranging from 90% in metropolitan areas to 61% in rural Upper Egypt. On the same survey, 90% of women residing in metropolitan areas delivered their most recent birth in a health facility, compared to 50% of women in rural Upper Egypt. In 2008, the use of private facilities for antenatal and delivery care was highest in urban Lower Egypt (87% and 71%, respectively, as a proportion of all facility deliveries) and lowest in metropolitan areas and rural Upper Egypt (69% of facility antenatal care and 55% of facility delivery care were obtained from the private sector in these areas).

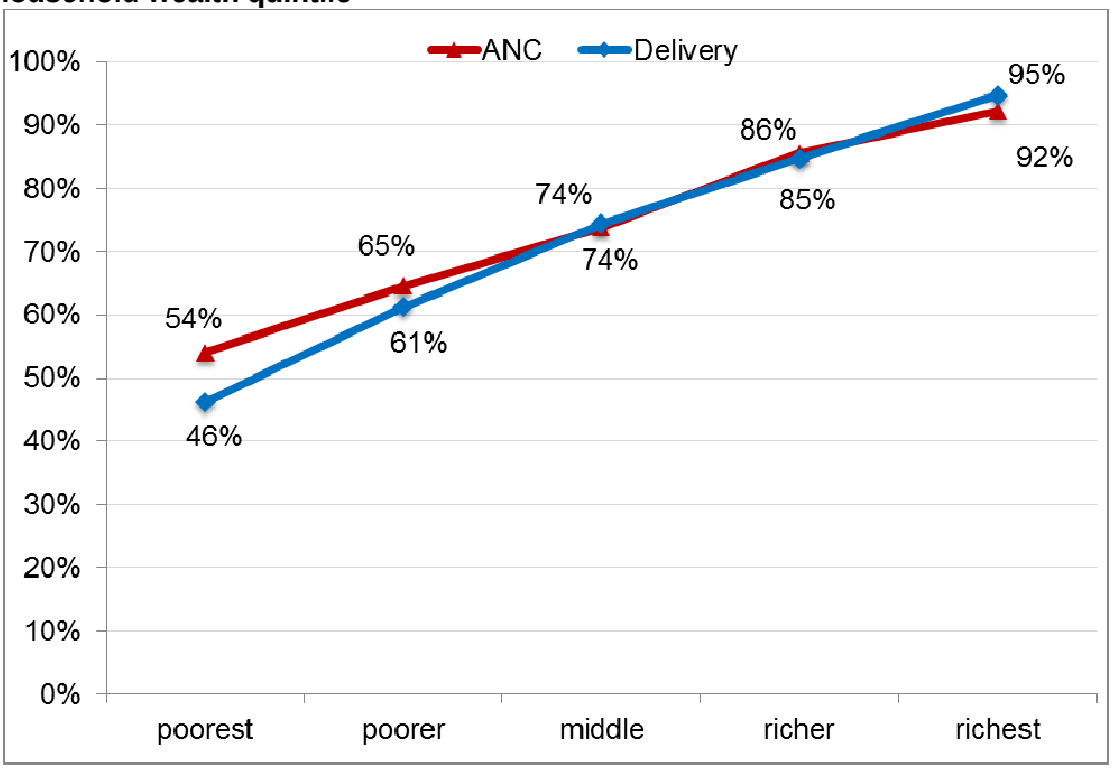
Due to low statistical power to disaggregate the small number of maternal deaths registered in 2000 (n=585), the association between socio-economic position and maternal mortality was not examined. However, the DHS data allows for an assessment of socio-economic gradients in the various indicators of maternal health. In the five years preceding the 2008 survey, less than half of most recent births to mothers in the lowest household wealth quintile occurred in a health facility (46%), compared to 95% among the richest quintile (Figure 2.4). Similarly, 92% of women from the richest quintile, but only 54% of women in the poorest quintile, sought antenatal care. Among users of facility based services, the differences between the wealth quintiles in percentages of women using private services are less pronounced; 64% versus 86% for antenatal care and 51% versus 74% for delivery care among women from poorest and richest wealth quintiles, respectively.

Figure 2.3 Percentage of most recent births in five years preceding DHS surveys for which mothers received any facility-based antenatal care and facility delivery care



Sources: Author's calculations based on EDHS 1992, 1995, 2000, 2005, 2008.[115,154,157-159]

Figure 2.4 Percentage of most recent births in five years preceding the 2008 DHS for which mothers received facility-based antenatal and facility delivery care, by household wealth quintile



Sources: Author's calculations based on EDHS 2008.

In public sector facilities, antenatal services are supposed to be provided free of charge in the morning and for a fee during the afternoon.[160] The 2004 Service Provision Assessment (the most recent nationally-representative health facility survey in Egypt) showed that a quarter of the facilities surveyed (n=559) charged user fees for antenatal care. This practice ranged from 5% of rural health units to 99% of NGO facilities.[140] Similarly, delivery care is available from both public and private facilities. Public hospitals operate three pricing schemes - public, *iqtisady* (commercial, for patients enrolled with the HIO), and *fundoqy* ("hotel" or private service, which enable an obstetrician to admit and deliver private-practice patients). An MOHP decree set the fee for the public scheme at 50 EGP, and hospital governors have the authority to set the price levels for *iqtisady* and *fundoqy* services.[160] In 2004, between a third of public hospitals and rural health units, two thirds of MCH and urban units, and all NGO delivery facilities charged fees for delivery.[140] To my knowledge, the fees for privately provided antenatal and delivery care services have not been systematically studied in Egypt. The 2008 DHS was the first nationally representative survey in Egypt to collect information on the prices women paid for antenatal and delivery care, and can be stratified by provider type. These data are analysed and presented in Chapter 5 of this thesis.

Lastly, it is important to note that as the proportion of births in facilities and proportion of deliveries in private facilities increased over time, the caesarean section rate rose in Egypt. Whereas in 1992, 4.6% of births in the five years preceding the survey occurred by caesarean section, this proportion was 28% in 2008 and exceeded 50% in 2014.[115,136,154] While an optimal caesarean section rate on a population level is contested, the World Health Organization considers levels above 15% as signalling unnecessary medical intervention.[161] Within countries, high overall caesarean section rates are known to mask rates that are too low among poor and rural women, and too high among richer and urban women.[162] However, it seems that the caesarean section rate in Egypt in 2008 was near or above 15% among the various vulnerable strata of women - living in rural areas (22%), in the poorest quintile of households (14%), as well as among women with no formal education (18%).[115] While large scale studies of quality of obstetric care have not been conducted in Egypt, facility-based observations indicate that inadequate procedures prevail and include routine labour augmentation, instrumental delivery, and suboptimal practices in management of the third stage of labour.[156,163]

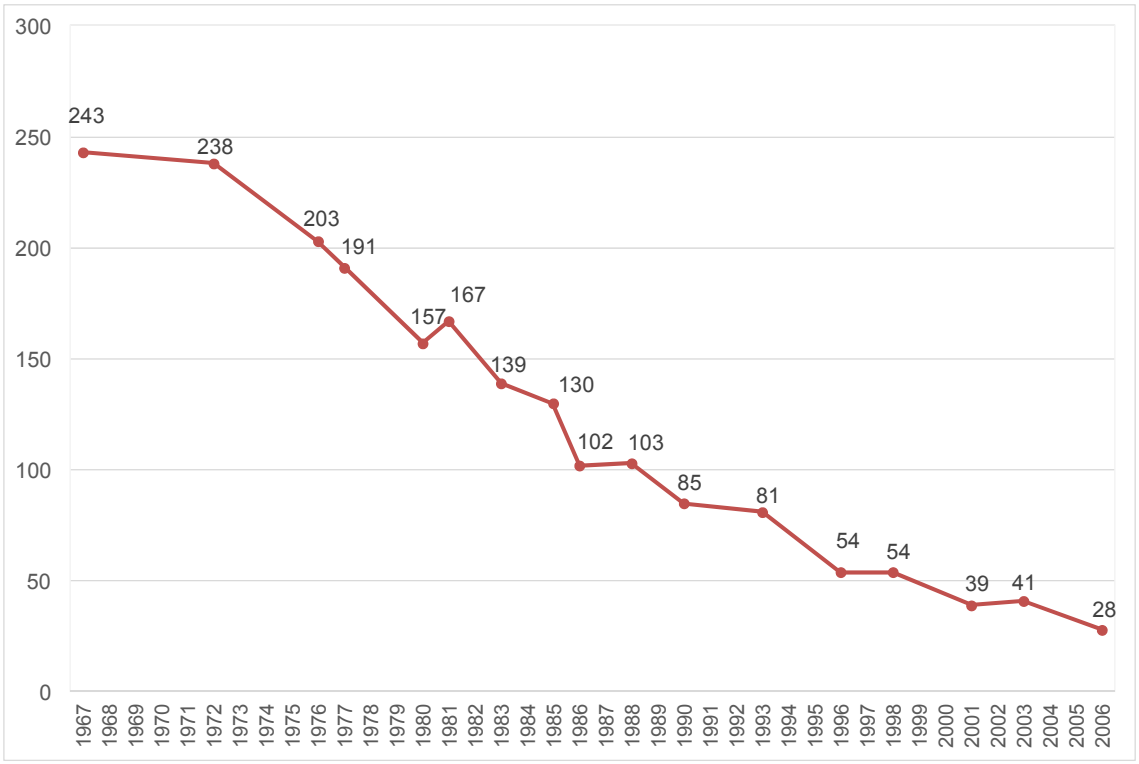
2.2.3 Child health

Similarly to maternal health, Egypt has been successful in reducing mortality among children under the age of five years (Figure 2.5). The <5 mortality rate decreased by two-thirds since 1990, to a level of 28 per 1,000 live births in 2006.[115] With a population of more than 9 million children <5, the current mortality rate of 22 per 1,000 births translated into 41,000 deaths in 2013.[164,165] Conditions related to birth and the immediate neonatal period (congenital anomalies, neonatal sepsis, birth asphyxia, and prematurity) accounted for 64% of these deaths, whereas diarrhoea and pneumonia accounted for 7% and 11% of <5 deaths, respectively.[166]

Figure 2.6 shows that the overall reduction in <5 mortality is primarily a result of large decreases in the mortality among children 1-4 years (90% decline between 1992 and 2008), followed by a 70% decline in the post-neonatal mortality rate during the same period. In 2008, approximately half of the <5 deaths happened during the first month of life (neonatal period). The preliminary report of the EDHS 2014 showed that the level of <5 mortality and its composition did not differ substantially from those recorded in 2008. This means that up to one half of the <5 deaths (or 20,000 deaths) in Egypt in 2013 occurred to children between the age of 1-4 years, the age during which pneumonia and diarrhoea are some of the most important causes of death.

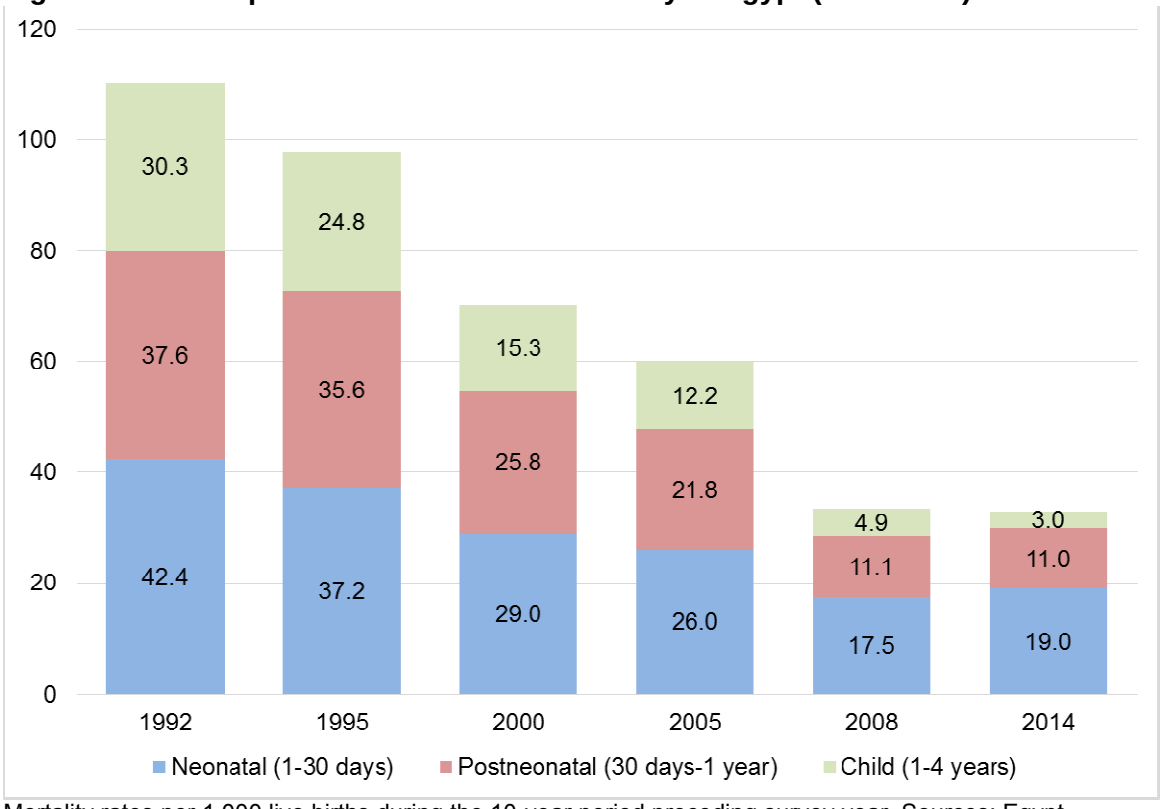
The decline in <5 mortality has been attributed to a host of health system interventions, including promotion of oral rehydration therapy through the National Control of Diarrhoeal Diseases Program in the 1980s, scale up of the Integrated Management of Childhood Illness (IMCI) protocol starting in 1999, increase in the proportion of children who received basic immunisations to near-universal levels, and coverage of children <5 in the HIO health insurance scheme.[167-172] Additionally, social and infrastructural improvements in the education level of women, decrease in unwanted pregnancies, and access to improved water and sanitation have aided in reducing child mortality and morbidity. However, nutritional indicators among children have remained lagging behind – based on the 2008 DHS, early initiation of breastfeeding was achieved in less than half of newborns and only 53% of children under the age of six months were exclusively breastfed. One third of children <5 were stunted.[115]

Figure 2.5 Under-five mortality rate (per 1,000 live births) in Egypt



Source: Egypt Demographic and Health Survey 2008.

Figure 2.6 Decomposition of under-five mortality in Egypt (1992-2014)



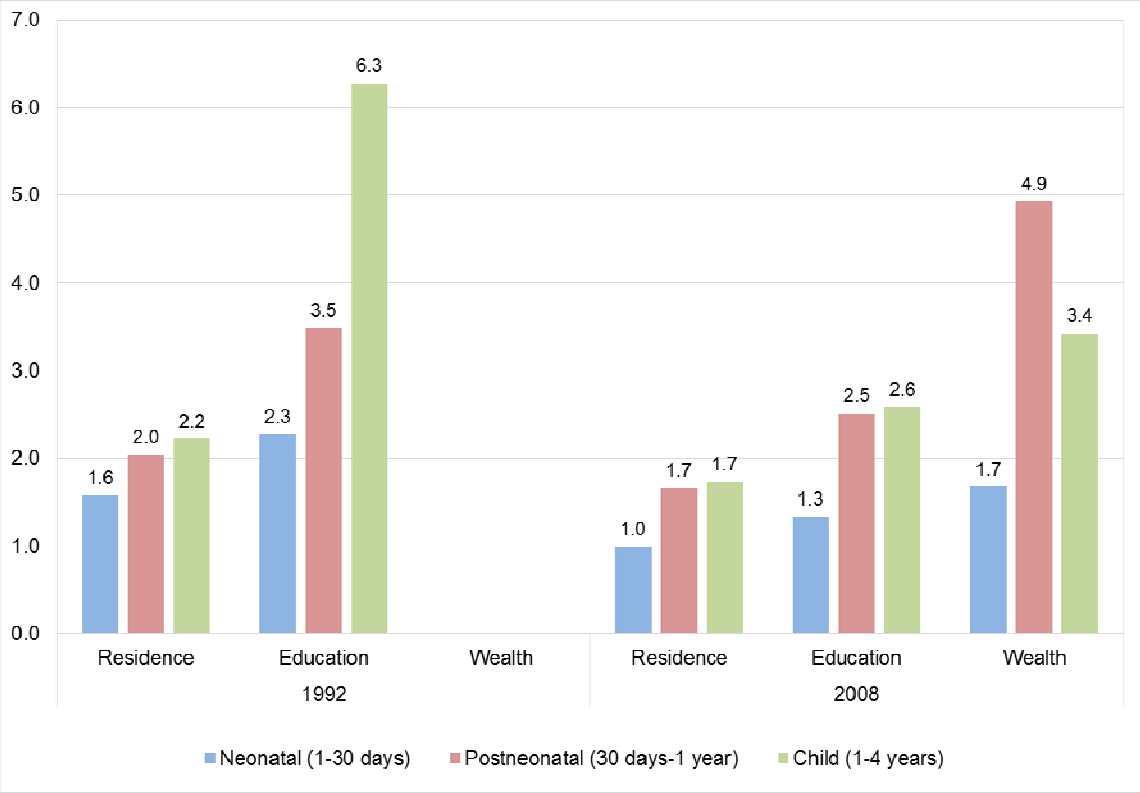
Mortality rates per 1,000 live births during the 10-year period preceding survey year. Sources: Egypt Demographic and Health Survey Reports 1992, 1995, 2000, 2005, 2008, 2014.[115,136,154,157-159]

The population-level statistics fail to capture large geographic and socio-economic inequalities in the survival of children <5, and slower rates of improvement in children from lower socio-economic backgrounds. For example, the <5 mortality rate was higher among children of mothers with no education in 2008 (44/1,000) than the levels among children of women with secondary or higher education 13 years earlier (40/1,000 in 1995). Figure 2.7 shows the ratios of neonatal, post-neonatal and child mortality between highest and lowest socio-economic categories of residence, education and wealth between 1992 and 2008. For example, if the mortality rate among the poorest quintile of households is the same as among the richest quintile, their ratio (poorest:richest) will equal 1.0, if mortality among the poorest is higher than among the richest, the resulting ratio will be greater than 1. This figure shows that in 1992, when neonatal mortality accounted for 38% of <5 deaths, children living in rural areas were 1.6 times more likely to die during the first month of life than children from urban areas. In 2008, when neonatal mortality accounted for 52% of <5 deaths, there was no difference in these rates between children from rural and urban areas (ratio of 1.0). In both time periods and comparisons, socio-economic inequalities in neonatal mortality were lower than inequalities in post-neonatal and in child mortality.

Post-neonatal and child mortality, which accounted for 48% of <5 deaths in 2008, were highly socio-economically patterned. However, the geographic inequality in post-neonatal and child mortality has remained similar (or slightly lower) in 2008 compared to 1992. The ratios in all three mortality rates comparing children with mothers of no education to mothers of secondary or higher education declined from 1992 to 2008. Despite this improvement, the post-neonatal and child mortality rates among children of mothers with no education were more than twice those of children with mothers of secondary or higher education. Wealth quintile of households was not calculated for EDHS surveys before the 2005 round, and the inequalities in 1992 are therefore not shown. However, the comparison of the three socio-economic measurements (residence, education and wealth quintile) in 2008 shows that lowest-to-highest ratios in all three mortality rates were highest when household wealth quintile was considered. Children from the poorest wealth quintile of households had substantially higher neonatal (1.7 times), post-neonatal (4.9 times) and child (3.4 times) mortality rates than children from the richest quintile. The nearly five-fold higher post-neonatal mortality rate among children from the poorest wealth quintile (21.2 per 1,000) compared to richest wealth quintile (4.3 per 1,000) is of particular note, as the period between one month and one year of age is one of heightened susceptibility to illness

during transition from breastfeeding to supplementary feeding, and before the complete set of immunisations is received.

Figure 2.7 Ratios of neonatal, post-neonatal and child mortality in 1992 and 2008, by residence (rural to urban), maternal education (no formal education to secondary/higher education) and household wealth quintile (poorest to richest)



Source: Author's calculation based on Egypt Demographic and Health Survey Reports 1992 and 2008. Household wealth scores and quintiles were not calculated by the DHS for Egypt surveys before the 2005 round.

Effective prevention and treatment of childhood illnesses, such as diarrhoea and pneumonia, can lead to further reductions in morbidity and mortality among children <5 years. However, their uptake and coverage rely on households' perception of need, health-seeking behaviours, and on the quality of care received once a health provider is reached. On the 2008 DHS, 7.8% of children <5 were reported to have had ARI and 8.5% diarrhoea in the two-week recall period. The data showed no obvious differences in the period prevalence of these two illnesses between children from households in the various wealth quintiles.[173] This lack of socio-economic inequality in the crude measures of illness reporting potentially points to health-seeking behaviour and quality of care as important determinants of child health outcomes and survival in Egypt.

Diarrhoea incidence among children <5 years in Egypt declined from 3.4 episodes per child per year in 1990 to 2.6 in 2010. The highest incidence was estimated for children

6-11 months (3.9 in 2010) and the lowest for children aged 24-59 months (2.0 in 2010).[124] Studies in various geographical regions in Egypt showed that the incidence of diarrhoea may be as high as 7-8 episodes per year, depending on the child's age and breastfeeding status, season, mother's age, and child's birth order.[174,175] Sensitivity of ARI symptom reporting is considered acceptable in Egypt (0.9 for "difficult breathing" and 0.5-0.6 for "fast breathing", depending on child age).[176] However, the specificity of symptom identification declines with recall period greater than two weeks.[177] The low positive predictive value of maternal recall of ARI (given generally low period prevalence of ARI in the two-week recall period) is suitable for analysis of treatment-seeking rather than for tracking proportions of ARI treated with antibiotics.[177]

The proportion of children <5 years with ARI that were taken to any health provider (excluding pharmacy) has increased from 59% in 1992 to 73% in 2008. Among children with ARI in 2008, 81% of children from the richest quintile of households were taken to a health provider compared to 70% of children from the poorest quintile. The difference in seeking health care for ARI between children of mothers with no education and secondary or higher education was much smaller (71% and 74%, respectively). Among children with diarrhoea in the two-week recall period, 56% were taken to a health provider (excluding pharmacy). Similarly to ARI, there was a wider difference (10 percentage points) in health-seeking for diarrhoea between children from richest (61%) and poorest quintiles of households (51%), than between children whose mother had no education (54%) compared to secondary or higher education (58%). The proportion of children with diarrhoea who received oral rehydration (ORS packet or home salt-sugar water solution) declined somewhat from 35% in 1992 to 28% in 2008. Appropriate treatment of diarrhoea with ORS was more likely to occur in public facilities, and private clinics and pharmacies were more likely to prescribe unnecessary antibiotics and anti-diarrhoeals.[172,178] Curative care for children is provided by public facilities free-of-charge (under the HIO coverage) or for a nominal fee (e.g., 1 EGP). Private providers are at liberty to set their own pricing schemes. Data about price paid for medical consultation(s), medications, laboratory tests or other direct and indirect expenditures for curative care for children with diarrhoea and ARI was not collected on the 2008 DHS and could not be assessed in this thesis.

2.3 Summary of context

To summarise the description of Egypt as a case study for analysis of socio-economic inequalities in health-seeking, I outline the main advantages of this particular context as well as the importance of this type of analysis for Egypt. Despite remarkable improvements in maternal and child mortality in recent decades, socio-economic inequalities in health outcomes and health-seeking behaviours suggest that avoidable mortality and morbidity needs to be addressed in this country. The coverage of health-seeking behaviours was high or nearly universal among women and children from high socio-economic position backgrounds. Therefore, improvements in population indicators depend largely on successfully increasing the coverage among those of lower socio-economic position. Additionally, the inequalities in these indicators were larger by wealth quintile than by education, raising questions about whether access to material resources, rather than knowledge and self-efficacy, was the primary determinant of health-seeking behaviours.

The Egyptian context also provides excellent health-system circumstances for analysis of health-seeking behaviours, due to the close geographic proximity of health services to the vast majority of its population. Its heterogeneous health system, and particularly the phenomenon of dual-sector practice among physicians, provides a context with a wide array of provider choice. The low penetration of health insurance, and especially of health insurance covering private care, means that seeking care with a private provider results in significant out-of-pocket expenditure. The virtual lack of regulation and accreditation of privately provided care means that the choice of provider relies largely on a consideration of the trade-off between perceived quality of care and its price, providing additional opportunity to assess the socio-economic patterning in provider selection. Egypt is a culturally and ethnically homogeneous country, which is nonetheless socio-economically diverse. The increasing prevalence of poverty (especially in rural areas) and the rising income gap, provide a context in which it is particularly important to understand whether different socio-economic attributes underlie the observed patterns in health-seeking behaviours in the overall population and among rural poor households in particular. Thus, Egypt is an ideal middle-income case study of a country with a plurality of healthcare providers, low geographical barriers to access, and a rural concentration of poverty.

Finally, Egypt is a regionally and globally important country with a large population and growing pressures on the allocation of public resources. Its recent societal, political and economic transformation has aided in increasing the recognition of social justice as an important component of the country's future development, and provides an excellent opportunity to formulate targeted policy interventions to further improve maternal and child health. However, evidence is needed to inform such policies. The next Chapter presents a systematic literature review of research on socio-economic inequalities in maternal and child health-seeking behaviours in Egypt. The findings of this literature review show that despite availability of data, few studies have attempted to measure and assess the existence and magnitude of socio-economic inequalities in maternal and child health-seeking in Egypt.

3 Systematic literature review and evidence synthesis of socio-economic gradients in maternal and child health-seeking behaviours in Egypt

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3.1 Abstract

Background

Health-seeking behaviour lies on the direct pathway between socio-economic position (SEP) and health outcomes. The objective of this systematic review is to identify and synthesise evidence of socio-economic gradients in health-seeking behaviours related to maternal and child health in Egypt.

Methods

Four databases (Medline, Embase, Global Health and Web of Science) were searched in September 2013 for material published in English from 1992 to 2013 for a combination of terms describing health-seeking behaviours and indicators of socio-economic position, with a geographical limitation to Egypt. Findings of articles were described and synthesised in a narrative format as meta-analysis was inappropriate.

Results

Among the 786 references identified, 10 articles met the inclusion criteria. Six articles examined maternal and five articles child health-seeking behaviours (one article examined both). For maternal health, three dimensions of health-seeking behaviour (receipt of any care, type of care and intensity of care) were covered by analyses of antenatal and one dimension (type of care) by analyses of delivery care. For child health, two dimensions of preventive care (coverage of and intensity of immunisation) and three dimensions of curative care (receipt of any care, type and price of care) were analysed.

Conclusions

Based on two articles of time trends in nationally-representative surveys, socio-economic inequalities in seeking care for basic preventive and curative interventions in maternal and child health appear to have narrowed. Limited evidence of gradients in intensity of maternal preventive and provider selection in child curative care showed that inequalities may have widened. In articles including more geographically and socially homogeneous samples, fewer gradients were identified. Current body of evidence contains numerous limitations and gaps and is insufficient to draw a conclusive summary of such gradients. Improved understanding of SEP gradients is crucial in designing and prioritising interventions to equitably improve maternal and child health outcomes.

3.2 Introduction

In virtually every context where they have been studied, inequalities in health outcomes based on living standards or on social hierarchy (as observed through various measures of socio-economic position, SEP) have been identified.[8] This association is hypothesised to arise mainly based on causal pathways encompassing healthcare access and utilisation, psychosocial determinants, health knowledge and behaviours, and environmental hazards.[18,25-27] As one of these pathways, health-seeking behaviour comprises several sequential decisions and actions through which individuals contact the healthcare system; including experiencing and reporting symptoms, seeking care, choosing a provider, paying for care, adhering to treatment, and timing and intensity of follow-up visits. Health-seeking behaviour includes preventive (e.g., immunisation and screening) and curative care (after the onset of symptoms).

A review of socio-economic determinants of health-seeking behaviour in low- and middle-income countries indicated that a variety of individual and households-level indicators have been used to reflect socio-economic position, including education, occupation, absolute or relative poverty level, and access to material, financial and productive resources (income, landholding, assets).[179] Rigorously evaluated interventions, such as conditional cash transfer (CCT) programs, showed that provision of cash transfers to female heads of households can increase healthcare utilisation patterns.[180] Socio-economic status is hypothesised to influence health-seeking behaviour through mechanisms such as material and intellectual resources and access to health facilities.[28,55] However, individuals rarely make health-related decisions in a social vacuum and their socio-economic position is not solely an individual-level characteristic. Therefore, the association between SEP and health-seeking behaviour can be examined on various levels, spanning from the individual and familial environment, to the wider community and country.

3.2.1 Objectives

The objective of this systematic review was to identify and synthesise evidence published in the previous two decades about the existence, magnitude and trends in socio-economic gradients in health-seeking behaviours related to maternal and child health in Egypt. Firstly, a summary of the types and dimensions of health-seeking behaviour analysed by included articles is presented. Secondly, I synthesise the

evidence regarding the extent of gradients identified, and lastly, limitations of current evidence and recommendations for future research are outlined. Maternal health-seeking behaviour for the purposes of this review refers to characteristics of care sought during pregnancy, childbirth and in the immediate post-partum period, including care intensity (timing and frequency), type of provider, and price of care. Child health-seeking behaviour is defined as actions taken in relation to healthcare for children <5 years of age. Preventive and curative health-seeking behaviours are included.

3.3 Methods

3.3.1 Data sources and search strategy

Four databases (Medline, Embase, Global Health and Web of Science) were searched in September 2013 for material published in English from 1992 to 2013. Where available, MeSH terms were combined with free-text terms capturing components of health-seeking behaviour (access, utilisation, provider selection, and price of care), a wide range of indicators of socio-economic position (education, literacy, employment, wealth, income, consumption, expenditure, assets, poverty, indebtedness) and geographic limitation to Egypt. The reference lists of included articles were also screened. The complete search strategy is presented in Table 3.1. The review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline (Table 3.2).[181] The review protocol was not registered.

3.3.2 Study selection and data extraction

Abstracts of all references identified in searches were screened and excluded if they did not contain data from Egypt or maternal or child health-seeking behaviour as an outcome measure. Cognizant that SEP indicators may be included in analyses as confounders and may thus not be identified as exposures in the abstracts, I screened full-text versions of remaining references. At this stage, I eliminated articles without SEP as an exposure or confounder, those in which the SEP variable used was not clearly defined, and those not presenting any statistical test (p-value, confidence interval or standard error) of the association between SEP and health-seeking behaviour. Descriptive information abstracted from articles included study design, study objective, study population and data sources, type of health-seeking behaviour examined and measures of SEP used. I classified each article according to its main objective into one of the following three groups: SEP was the main determinant

examined by the article, SEP was one of the several risk factors examined by the article or SEP was one of the confounders used in the article. Abstracted information on findings included type of statistical analysis and tests used, crude and adjusted parameters that quantified the association between SEP measure(s) and health-seeking behaviour outcomes and confounders included in adjusted analyses, if any. No data were obtained from investigators, but results were confirmed with authors of Stephenson et al (2012). For the results of Gwatkin et al (2007), binary significance levels of the concentration indices (≤0.05, >0.05) were calculated by using the standard errors reported by this study.

3.3.3 Analysis

No meta-analysis was performed because there was an insufficient number of comparable estimates for any single health-seeking behaviour. Findings were described and synthesised in a narrative format. The results of analyses are presented separately for each dimension of health-seeking behaviour: 1) Seeking any care, 2) Type of care sought/received, 3) Intensity of care received, and 4) Price paid for care, based on a conceptual approach used by Pokhrel and colleagues.[69] A risk of bias assessment was developed based on the Newcastle-Ottawa quality assessment scale.[182] This tool was used in consideration of the strengths and limitations of the available evidence.

3.4 Results

A total of 786 unique references were identified and screened. The majority (83%) of excluded references did not examine any component of health-seeking behaviour. From 64 references reviewed in full-text, 10 articles met the inclusion criteria (Figure 3.1). Six articles examined maternal health-seeking behaviours and five articles examined child health-seeking behaviours (Tables 3.3 and 3.4, respectively, articles listed in chronological order by year of publication); one article included both behaviours. Among the ten included articles, nine set out to examine the association between socio-economic position and health-seeking behaviour, either as the main exposure or one of several main exposures.

3.4.1 Maternal health-seeking behaviours

Three of the six articles analysing maternal health-seeking behaviours were based on the nationally representative population-level Demographic and Health surveys (DHS) collected between 1995 and 2008.[183-185] The remaining three articles analysed small samples of (<250) women in specific geographic locations; the city of Alexandria,[186] six villages in Beni Sueif governorate [187] and a Giza village.[188] The study design of all six articles was cross-sectional.

Four articles analysed whether women received any antenatal care (ANC) or ANC from a medical professional during pregnancy (Figure 3.2, Table 3.3). The proportion of women receiving any ANC in the samples used by the articles ranged from 33.8% to 71.4% for any ANC, and for any ANC with a medical professional ranged from 42.5% to 73.2%. Four articles examined ANC frequency (number of ANC visits during pregnancy) and one article each looked at the timing of the first ANC visit and at the pattern of ANC use (combining frequency and timing into one indicator). In regard to delivery care, four articles assessed various characteristics of the health provider (skilled or traditional birth attendant) or facility (any, public, private, home) where women sought care.

Four articles of maternal health-seeking behaviour used women's individual-level SEP measures: education or literacy in four articles, and employment-related SEP measurement (occupation status and cash income earnings) were used by one article each. Two articles evaluated the spouse's individual-level SEP measures (education and occupation). All articles that analysed DHS surveys relied partly or solely on quintiles of the wealth index, a household-level measure.[189] Other household-level measures of SEP included family socio-economic status (SES) based on a score suggested in 1983 by Fahmy and Sherbini [190] and binary variables indicating ownership of various assets (land, house, cattle), access to potable water, and monthly meat consumption. One article examined the association between health-seeking behaviour and community-level economic prosperity, which was constructed as mean of the DHS household-level wealth scores within each survey primary sampling unit (PSU). Two of the six articles showed the absolute levels of health-seeking behaviours under investigation for each SEP category. To assess the existence and magnitude of the association between SEP and maternal health-seeking behaviours, four articles used an odds ratio and two articles the concentration index, both relative effect measures.

3.4.1.1 Antenatal care

The two articles which analysed more than one DHS survey both reported only a crude measure of association between SEP and health-seeking behaviours (Gwatkin 2007, Khadr 2009), shown in Table 3.5. However, by using the concentration index, which quantifies the extent of a SEP gradient, they allowed for comparison of time trends. The concentration index is twice the area under the Lorenz curve of inequality, showing the cumulative distribution of an outcome according to cumulative distribution of wealth. Concentration index values range between -1, indicating absolute inequality of the outcome concentrated among the poorest and +1, showing absolute inequality concentrated among the wealthiest, with 0 signifying perfect equality. The definitions of health-seeking behaviours reported were similar (except for ANC regularity, which Gwatkin defined as ≥3 visits and Khadr as ≥4 visits). Both articles showed that women from lower wealth quintiles were significantly less likely to have received any ANC and regular ANC than women from richer wealth quintiles. Concentration index values for 1995 and 2000 differed between the two articles for the four indicators they both evaluated. Wealth score and quintile became available to users of the DHS starting with the 2005 survey, and authors calculated their own wealth index for the two prior surveys, possibly using different component variables, which may be the main reason for this difference. For both indicators of antenatal care, the concentration index value decreased between the 1995 and 2005 surveys, but remained higher for regular ANC than for any ANC use. Khadr found that while the concentration index value for these two ANC behaviours based on education level remained significant and concentrated among women with higher SEP; the values were closer to zero than the concentration index based on wealth quintile.

In order to approximate the level of community affluence, Stephenson et al (2012) constructed a community-level wealth index based on the household wealth index of respondents in the same primary sampling units. They concluded that community-level economic prosperity was not associated with any ANC, regular ANC or timely ANC (first visit in first trimester of pregnancy) use. Receiving regular ANC in a Giza village was associated with primary or higher education level - both woman's and her husband's, but not with woman's cash income, in crude analysis (Chiang 2012). Crude analysis of a sample from villages in Beni Sueif showed a significant positive association between maternal and paternal literacy (individual-level) and land ownership (household-level) with the likelihood of receiving any ANC (Yassin 2003). An article describing a study in Alexandria reported that neither education nor family SES score were significantly associated with adequate pattern of ANC clinic attendance

among women attending an ANC clinic, when adjusted for woman's age group, parity, knowledge of ANC use, level of medical risk, and health belief model score (Abdel Houssein 1997).

3.4.1.2 Delivery care

The concentration index values for obtaining skilled delivery care appeared to have decreased between 1995 and 2005, yet the values remained significant, and higher based on wealth quintile than on education level (Gwatkin 2007, Khadr 2009). Gwatkin and colleagues reported that women from lower household wealth quintiles were significantly less likely to deliver in private facilities and in public facilities, compared to women from higher quintile households, in both 1995 and 2000, but the concentration index value had decreased over this timeframe. Both Gwatkin and Khadr concluded that women from lower wealth quintiles were significantly more likely to deliver at home in all surveys analysed. However, whereas Gwatkin reported that the concentration index value increased between 1995 and 2000, Khadr noted a decrease between 1995 and 2005. Khadr's analysis showed that the concentration index value for home delivery was smaller when SEP was measured by education level rather than household wealth quintile, but remained significant, favouring women with higher SEP. Using the 2008 DHS, Stephenson et al reported no significant difference, in adjusted analysis, in the odds of delivery in any health facility compared to at home based on community-level wealth. Lastly, crude analysis of health-seeking behaviour in a Giza village revealed that higher level woman's and husband's education were significantly positively associated with the odds of delivery with a skilled medical professional and delivery in any health facility. However, woman's cash income was not associated with either delivery-related health-seeking behaviour (Chiang 2012).

3.4.2 Child health-seeking behaviours

Five articles analysing SEP determinants of health-seeking behaviour for children were identified; two included assessment of immunisation coverage and four examined aspects of curative health-seeking for common childhood illnesses (Figure 3.2, Table 3.4). Two articles analysed nationally-representative samples; one by following up on National Immunisation Days (Reichler 1998) and the other examined two rounds of EDHS (Gwatkin 2007). Two papers reported findings from samples in Minia governorate based on the Two Governorates Linkages Survey (Yount 2003 and Yount 2004), and the remaining article assessed health-seeking behaviours for infants in a primary health centre catchment area in Assiut (Fadel 2007). Although this article

included prospective cohort data collection method, all findings were based on cross-sectional analyses.

Between the two articles examining receipt of immunisations, socio-economic determinants of disease-specific immunisation coverage (BCG, measles, DPT, Hepatitis B, polio), and of overall immunisation status based on national guidelines (full basic immunisation, no basic immunisation) were assessed. In regard to curative care, health-seeking behaviours following reported childhood illnesses (any illness, diarrhoea, acute respiratory infection-ARI, or fever) were examined, specifically whether any medical care was sought, the type of medical provider and health facility approached, and price paid for care. Three of the five articles used parental SEP, namely maternal and paternal education level and employment status, and maternal asset ownership. All three articles using individual-level variables also used household-level measures of SEP; the remaining two articles analysed solely household-level measures. The household-level SEP measures included DHS wealth quintiles, binary TV and radio ownership, and major asset ownership. Four of the five articles showed the absolute levels of health-seeking behaviours under investigation for each SEP category. The assessment of the association between SEP and maternal health-seeking behaviours was conducted using relative effect measures in four articles (three used odds ratios and one concentration index value) and an absolute measure in one article (risk difference).

3.4.2.1 Immunisation coverage

Both articles examining the association between SEP and receipt of immunisations presented only crude effect estimates (Table 3.6). In their analysis of polio vaccine coverage during the 1995 National Immunisation Days, Reichler et al concluded that children living in households with a radio or a TV were significantly more likely to have received two oral polio virus vaccine doses than one or zero doses. Using concentration index based on household wealth quintile, Gwatkin et al reported that children from lower quintile households were less likely to be immunised against BCG, measles, and DPT (3 doses) than those from higher quintiles, although the concentration index value had decreased between 1995 and 2000. The concentration index value for Hepatitis B immunisation was only available for 1995 and showed the highest level (higher coverage among children from wealthier quintile households) among the various vaccines. Children from lowest wealth quintile households were significantly more likely to have received no basic immunisation coverage, and the

concentration index value declined only marginally in the five-year period between surveys.

3.4.2.2 Curative care

In terms of the first dimension of curative health-seeking, seeking advice from a medical provider, Gwatkin's crude analysis showed that children from lower quintiles were less likely to receive care with symptoms of fever, acute respiratory infection (ARI) and diarrhoea compared to children from higher quintile households. However, whereas the concentration index value decreased between 1995 and 2000 for symptoms of fever and ARI, these values increased with respect to diarrhoea. The highest concentration index value in 2000 for this dimension was seen in health-seeking for symptoms of ARI. In a small sample of infants in Assiut, Fadel examined the association between SEP and seeking medical advice following symptoms of diarrhoea. In crude analysis, only household TV ownership was marginally positively associated with seeking care, but ceased to be significant in adjusted analysis.

Four articles examined the association between SEP and type of care chosen for childhood illness among the subsamples of children for whom any medical care was sought. In the nationally-representative DHS surveys, Gwatkin reported results of a crude association, finding that children from lower quintile households were less likely to have received care from a private provider. Whereas the concentration index value was smaller for symptoms of diarrhoea compared to ARI or fever in both surveys, the value had increased for all three illnesses between 1995 and 2000. Among infants in Assiut for whom medical care was sought for diarrhoea, utilisation of private care was associated with higher levels of both mother's and father's education, and with mother's employment status in crude analysis (Fadel 2007). Among these three SEP indicators, only mother's education remained significantly positively associated with private care utilisation in adjusted analysis. In a sample of children taken for care for diarrhoea, fever, cough or rash in Minia, the adjusted odds of seeking a private doctor were significantly higher for those with higher number of maternal and household assets, but not associated with maternal or paternal education or maternal ever-employment (Yount 2004). Analysing a smaller sample of children with diarrhoea in Minia, Yount (2003) found that neither the type of medical provider (doctor, pharmacist, other, lay) nor the type of facility (public, private, pharmacy) sought was associated with maternal education or household assets in adjusted analysis. This article also found no association, after adjusting for various confounders, between household asset ownership and price paid for care.

3.5 Discussion

Articles using nationally representative datasets found evidence of an association between SEP and maternal health-seeking behaviours. Women living in lower wealth quintile households were less likely than those from wealthier households to receive any and regular ANC, or to deliver with a skilled attendant or in a health facility. The magnitude of this association was smaller when women's SEP position was measured by education level compared to household wealth. However, no association was found between community-level affluence and maternal health-seeking behaviours. These differences in the existence and extent of SEP gradients suggested that material/financial resources may have been a more important determinant of utilisation (potentially via direct and indirect costs of care) than women's knowledge of the need for care or its availability. On the other hand, the only adjusted analysis of a small sample found that women's education or household-level SES score did not predict the pattern of ANC attendance among women attending ANC clinics, potentially suggesting that once women access ANC care, determinants other than SEP contribute to the intensity of care they receive.

Children from wealthier households were significantly more likely to have been immunised, for separate illnesses and for a combination of basic immunisations, compared to children from poorer households. Analysis of time trends revealed that this gradient had decreased between 1995 and 2000, potentially as a result of high overall immunisation coverage. Crude analysis of a nationally representative sample showed that the gradient in care-seeking for symptoms of childhood illnesses favoured children from higher wealth quintile households, but while remaining significant, decreased over time. A significant and increasing inequality in private provider use based on household wealth was identified for all three childhood illnesses examined. This may be a result of the fact that the price of private care is higher than of public care.[191,192] However, in smaller samples from Upper Egypt, conflicting results about the existence of an association between SEP and utilisation of any curative care and private provider selection for child illnesses were reported. This may have been due to real differences between the populations from which samples were drawn, or be partially or fully explained by the difference in analysis methods (crude versus adjusted) or definition of illness (diarrhoea and any illness). The evidence on existence of an association between SEP and the price paid for care was limited to one article (not adjusted for provider type) of a small sample, and therefore carried limited generalisability.

3.5.1 Limitations of available evidence

I considered selection bias, information bias (related to exposure or outcome) and analysis methods in assessing data quality of each article (Table 3.7).

Five articles used nationally representative survey data. The remaining smaller surveys considered selection bias (by including, for example, all women attending ANC, all mothers living in villages, or utilising simple random sampling in a community), they often neglected to describe the specifics of the population their sample represented. It was unclear whether sample sizes were calculated based on sufficient power to detect gradients in health-seeking behaviours, or whether previously collected data was used to analyse health-seeking. Therefore, the findings of several such articles have limited generalisability not only on the population level, but also for the understanding of local-level determinants of health-seeking. All included articles relied on cross-sectional analysis, and no analysis of individual-level time patterns of health-seeking behaviours was identified.

Two of the included articles specifically analysed socio-economic determinants of health-seeking behaviours. Seven articles attempted to identify determinants of health-seeking behaviours and one paper included SEP as a confounder in analysis of gender. Articles using separate variables, such as education level or binary asset ownership described the definition and categorisation of exposure categories better than those using component variables (SES score, household wealth quintile). Potential bias may stem from data collection methods – articles failed to report on and examine which member of the household reported on the various indicators of SEP (own, other members' or household-level) and whether this person could do so reliably.

Limitations in the definitions of health-seeking behaviours in included articles relate mainly to type of provider or facility. The method of categorising health providers into skilled or unskilled and health facilities into public or private was not always explicit and may have relied of respondents' self-report. This concern is particularly pertinent to the use of pharmacies without previous medical consultation, a common practice in Egypt. The existence and extent of an SEP gradient by provider type may change as a result of the inclusion or categorization of pharmacies. Misclassification may have occurred in regard to type of provider, because many public sector medical professionals also practice privately. In addition, respondents may not know, correctly recall, or be willing

to report the level of medical qualification of the provider used. The recall period used by articles for reporting of health-seeking behaviours seemed appropriate – longer for maternal care where information surrounding a birth is more likely to be remembered, and shorter (two weeks preceding survey or prospective data collection) for events related to child health. Child curative care relies heavily on the perception and reporting of child ill health. However, only Yount 2004 and Fadel 2007 used perceived severity of illness in their adjusted analyses of health-seeking determinants.

Several important gaps in the body of evidence remained. In regard to maternal health-seeking, no analysis of SEP determinants of the type of facility (public or private) chosen by users of antenatal care was identified. Further, no study modelled the number of visits (frequency) of ANC care as a continuous variable, which would enable detailed analysis of the dose-response effects of SEP. No analysis of post-natal care, a crucial component of the maternal health package, was identified. Neither the determinants of facility level (health centre, hospital) nor of a combination of provider qualification and facility characteristics were examined for delivery care health-seeking. Lastly, expenditures related to maternal health-seeking and their association with SEP were not examined by any study. Compared to maternal care, available evidence for child health-seeking included more dimensions of behaviours related to curative, but fewer dimensions related to preventive care. No studies analysed types of providers and facilities approached or price paid for childhood immunisations. No evidence examining gradients in frequency of care (number of visits made) and types of providers approached (if more than one) received for childhood illnesses was identified. Lastly, the type of symptoms for which curative health-seeking was analysed was limited to three; no evidence examining other important issues, such as childhood injuries or mental health was identified.

The use of a statistical test to assess the existence and extent of SEP gradients was an inclusion criterion in this review. However, included articles suffered from several other limitations in their analyses. Six articles only presented results of crude analyses and this was a major limitation of the usefulness of articles that employed nationally-representative data. The usefulness of analyses to policy is also limited by the number of subsequent dimensions of health-seeking behaviour assessed in any given study. A gradient in intensity of care (dimension 3) may not only be a result of inequalities experienced at that point, but also a consequence of accumulated inequalities in seeking care (dimension 1) and the type of provider used (dimension 2). For example, in the only analysis of price paid for care identified by this review (Yount 2003), the

adjusted analysis did not include provider type and cannot therefore elucidate the SEP gradient in expenditures based on provider choice. Further, all five articles presenting adjusted analyses used various SEP indicators in one adjusted model, thereby controlling for (eliminating) the pathways of association from one SEP indicator through those remaining.

3.5.2 Strengths and limitations of systematic review

In addition to limitations of the articles included in this review and the gaps in the body of evidence, limitations of this systematic review were also assessed. The search strategy targeted global and regional databases, but only English sources were searched. Complete retrieval of articles identified for full-text review was achieved. Health-seeking behaviour is not a new concept, although it is a recent term, and care was taken to identify and use as many synonyms and components as possible in the text and MeSH terms used. Likewise, a wide range of potential SEP indicators was compiled and used in searches. However, the search strategy may have missed articles which used socio-economic indicators as confounders, but did not list them in the title, abstract or keywords. Most articles looked at a range of factors associated with health-seeking behaviours, not solely SEP. Therefore, while no formal assessment of publication bias was conducted, it is possible that articles which failed to find an association between health-seeking behaviour and SEP did not report the estimates. Such articles may also not have been submitted or accepted for publication. Despite the fact that only quantitative articles assessing the existence and extent of SEP gradient were included in the review, it was not possible to produce a summary measure of association due to the variability of definitions, effect estimates and analysis methods in individual articles.

3.6 Conclusion

Following large improvements in coverage of maternal and child health interventions in Egypt, socio-economic inequalities, and in particular the rural concentration of poverty, have been identified as the primary determinants of remaining disparities.[150,193] As one of the pathways in this association, health-seeking behaviours could contribute to such gradient in health outcomes. While the body of evidence presented in this Chapter contains several limitations, I have attempted to synthesise the available evidence related to inequalities in dimensions of maternal and child health-seeking behaviour.

On the national level, socio-economically patterned inequalities in seeking any care for basic preventive and curative interventions in maternal and child health appear to have narrowed. However, the extent of this gradient seems larger measured by wealth compared to education, and further exploration to determine whether and how knowledge and affordability of care drive these inequalities is necessary. On the other hand, the limited evidence of gradients in intensity of preventive care in maternal, and provider type in child curative care, showed that inequalities may have widened. In studies of more geographically and socially homogenous samples, fewer gradients were identified, signifying that in areas with comparable health service supply, future research will need to examine determinants of health-seeking beyond the traditionally used SEP indicators.

Overall, although ten articles examining socio-economic inequalities in health-seeking behaviours were identified, the body of research contains numerous gaps and the quality of available evidence is insufficient to draw a conclusive summary of the extent of gradients in Egypt. Future research needs to address gaps in the assessment of the various dimensions of maternal and child health-seeking behaviours, while carefully defining constructs underlying SEP indicators and correctly modelling this association in statistical analyses. This understanding will be crucial in designing and prioritising interventions to equitably improve maternal and child health outcomes in Egypt.[194]

Figure 3.1 Systematic review search and inclusion flowchart

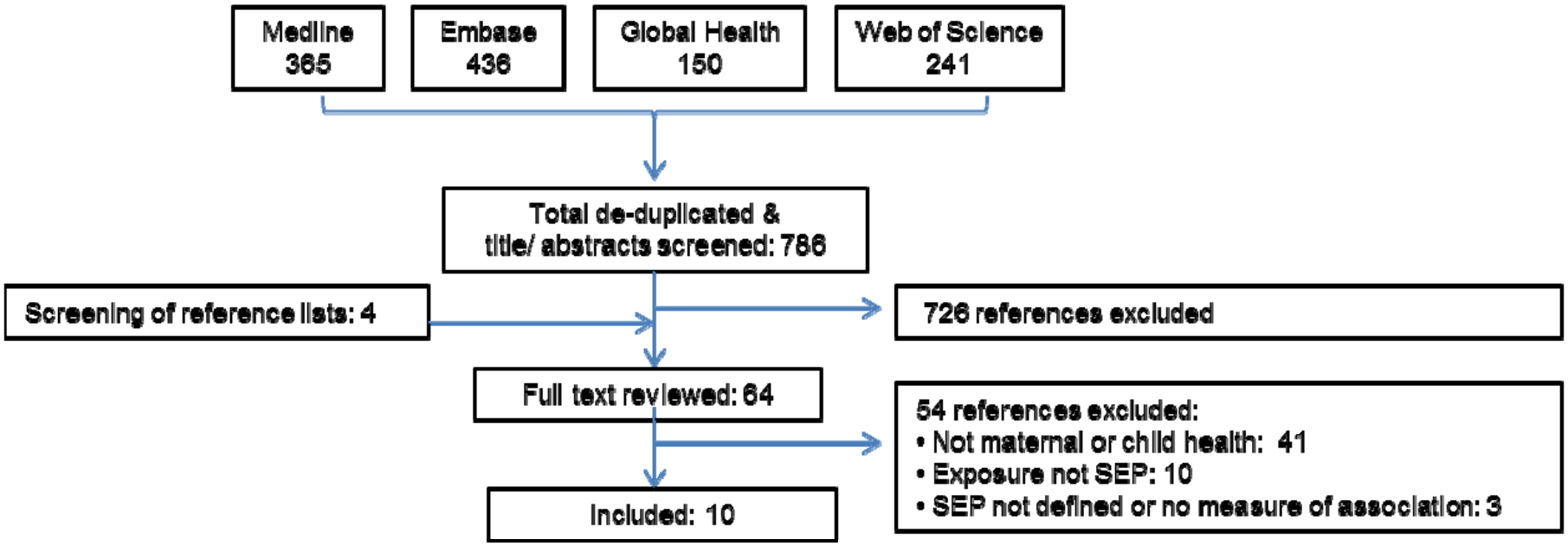


Figure 3.2 Maternal and child health-seeking behaviours analysed in articles

Domain	Dimension	Health-seeking behaviour	Study #
Maternal health			
Antenatal care	1. Any care received	Any ANC received	2, 4
	2. Type of care (provider, facility)	Any ANC with medical professional	3, 6
	3. Intensity (frequency, timing)	Regularity of ANC (> or ≥3 visits)	3, 4, 5, 6
		Timing of ANC (start in 1st trimester)	6
		Pattern of ANC (adequate timing and regularity)	1
Delivery care	2. Type of care (provider, facility)	Delivery with skilled attendance	3, 4, 5
		Delivery at any health facility	5, 6
		Delivery at public facility	3
		Delivery at private facility	3
		Delivery at home	3, 4
Child health			
Immunisation	1. Any care received	Immunisation received (various types)	1,5
	3. Intensity (coverage)	Full basic immunisation	5
Childhood illness	1. Any care received	Any medical assistance received	4, 5
	2. Type of care (provider, facility)	Type of healthcare provider	2
		Type of facility	2
		Private care (binary)	3, 4, 5
		Public care (binary)	5
	4. Cost of care	Amount spent	2

Preventive care — Curative care

Table 3.1 MeSH and text search terms used in databases searched according to algorithm (1 AND 2 AND 3)

Search Concept	Text search terms	MeSH terms
Database	(Medline, Embase, Global Health and Web of Science)	(Medline, Embase and Global Health)
1. Health-seeking behaviour	((health OR health-care OR healthcare OR health-related OR provider OR help OR care OR therap* OR treatment) AND (seeking OR behavio?r OR decision OR choice* OR utili?ation OR narrative OR network)) OR ((illness OR sick*) AND (perception OR narrative)) OR ((out?of?pocket OR private OR health) AND (expen* OR cost* OR payment OR fee OR charge)) OR pathways to doctor OR pathways to the doctor OR health-seeking OR help-seeking OR care-seeking	**Medline:** Attitude to Health, Health Behavior, Illness Behavior, Direct Service Costs, Cost of Illness, Fees, Medical. **Embase:** health related behavior, patient attitude, health care utilization, health care access. **Global Health:** health care utilization, social barriers, Health care costs
2. Socio-economic determinants	socio-economic OR socioeconomic OR social status OR social class OR social position OR economic position OR poverty OR inequalit* OR gradient* OR deprivation OR SES OR SEP OR employment OR occupation OR unemployment OR education* OR school* OR graduat* OR literacy OR numeracy OR income OR wage OR pension OR salary OR wealth OR asset* OR loan OR debt OR borrow* OR consumption OR expenditure OR spend* OR housing OR crowding OR determinant* OR sociodemographic	**Medline:** Socioeconomic Factors, Sociometric Techniques, Social Class. **Embase:** Social status. **Global Health:** Socioeconomic status
3. Egypt	Egypt*	**Medline, Embase, Global Health:** Egypt#

Table 3.2 PRISMA guidelines checklist

Section/topic	#	Checklist item	Reported in:
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	Title
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Abstract
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	Introduction
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	Objectives
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	Methods
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	Methods
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	Methods
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Table 3.1
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	Methods
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	Methods
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	Methods
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	Methods

Section/topic	#	Checklist item	Reported in:
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	Methods
Synthesis of results	14	Describe the methods of handling data and combining results of studies, including measures of consistency.	Not applicable
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	Not applicable
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	Not applicable
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	Results
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	Table 3.3 Table 3.4
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Table 3.7
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Table 3.5 Table 3.6
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	Not applicable
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	Table 3.7
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	Not applicable
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	Discussion
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	Discussion
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	Conclusion

Table 3.3 Descriptive characteristics of articles on maternal health-seeking behaviour

#	Author, Year	Study design	Study sample and objective	Exposure: SEP definition	Outcome: Health-seeking behaviour(s) – type, definition and level in sample
1	Abdel Houssein, 1997[186]	Cross-sectional	Pregnant women in third trimester attending 6 randomly selected MCH centers in Alexandria, all pregnant women in third trimester interviewed (no date of study provided), n=240. SEP: One of risk factors.	**IS: Education level** (no information on number or types of categories). **HH: Family SES score** based on education (woman and husband), monthly per capita income (no further information), crowding and household sanitation.	**Pattern of attendance of ANC clinics:** based on timing of initial visit (1st ANC visit during 1st trimester) and total number of ANC visits for current pregnancy; classified (no further information) into adequate and inadequate. Level: 28.8% adequate.
2	Yassin et al., 2003[187]	Cross-sectional	6 villages in Beni Sueif, all mothers of children less than one year old living in an area around a sentinel site (no date of study provided), n=231. SEP: One of risk factors.	**IS: Literacy** (binary), **occupation** (binary). **IO**: **Spouse literacy** (binary), **spouse occupation** (binary). **HH: Land ownership** (binary), **house ownership** (binary), **cattle ownership** (binary), **access to potable water** (binary), **meat consumed <4 times in previous month** (binary).	**Receipt of any ANC** at local primary center during most recent pregnancy (with child <1 year old). Level: 33.8% received any ANC.
3	Gwatkin et al., 2007[183]	Cross-sectional	EDHS 1995, 2000. Population representative sample of ever-married women. Last birth among women with at least one birth in the five years preceding the survey, n: 1995=7797, 2000=7953. SEP: Main determinant.	**HH: DHS Wealth index quintile.**	**Any ANC by a medically-trained person** (at least one consultation from a doctor, nurse or trained midwife). Level: 1995: 42.5%, 2000: 55.7%. **Multiple (3+) ANC visits with medically-trained person.** Level: 1995: 34.9%, 2000: 43.7%. **Delivery with skilled attendance** (doctor, nurse or midwife). Level: 1995: 46.2%, 2000: 60.9%. **Delivery location: Public facility.** Level: 1995: 17.9%, 2000: 22.2%. **Delivery location: Private facility.** Level: 1995: 14.6%, 2000: 26.0%. **Delivery location: Home (woman's or another home).** Level: 1995: 67.0%, 2000: 51.7%.
4	Khadr, 2009[195]	Cross-sectional	EDHS 1995, 2000, 2005 Population representative sample of ever-married women. Last birth among currently married women with at least one birth in the 5-years preceding survey; n: 1995=7828, 2000=7823, 2005=9744. SEP: Main determinant.	**IS: Education level** (no education, some primary, primary to secondary, completed secondary and higher). **HH: DHS Wealth index quintile.**	**Any ANC received** (no further definition). Level: 1995: 42.4%, 2000: 54.1%, 2005: 71.4%. **Regular ANC received** (4+ visits during pregnancy). Level: 1995: 31.0%, 2000: 40.7%, 2005: 61.3%. **Delivery with skilled attendance** (no further definition). Level: 1995: 41.7%, 2000: 55.8%, 2005: 70.5%. **Home delivery.** Level: 1995: 64.5%, 2000: 49.1%, 2005: 33.6%.
5	Chiang et al., 2012[188]	Cross-sectional	2007 survey of married women <50 years from a Giza village, n=189. SEP: One of risk factors.	**IS: Woman's education** (no primary, completed primary or higher), **existence of cash income** (binary). **IO: Husband's education** (primary school or lower, higher than primary).	**Regular ANC (4+ visits) during most recent pregnancy**. Level: 48.7%. **Delivery with skilled medical professional at most recent delivery**. Level: 79.4%. **Delivery in a health facility at most recent delivery.** Level: 61.4%.
6	Stephenson et al., 2012[185]	Cross-sectional	EDHS 2008. Population representative sample of ever-married women. Last birth among women with at least one birth in the five years preceding the survey, n=7813. SEP: One of risk factors.	**C: Community-level economic prosperity** - mean score of household wealth (DHS wealth score) per PSU (primary sampling unit), continuous variable.	**Any ANC received** (from a medically trained person). Level: 73.23%. **Regular ANC received** (4+ visits). Level: 65.75%. **First ANC visit received in 1st trimester.** Level: 59.48%. **Delivery in a health facility.** Level: 71.25%.

EDHS – Egypt Demographic and Health Survey. Measures of SEP: IS: Individual – self, IO: Individual– other (spouse, mother, etc), HH: Household-level, C: Community-level

Table 3.4 Descriptive characteristics of articles on child health-seeking behaviour

#	Author, Year	Study design	Study sample and objective	Exposure: SEP – type, definition, level in sample	Outcome: Health-seeking behaviour(s) – type, definition and level in sample
1	Reichler et al., 1998[196]	Cross-sectional	Nationally-representative survey of children under 48 months of age surveyed one month after second National Immunisation Day (NID, polio) round in 1995, n=4188 children from 3216 households. SEP: One of risk factors.	**HH: Radio in household** (binary), **TV in household** (binary).	**Number of doses of OPV (oral poliomyelitis vaccine) received.** Level: 0 doses: 9% (CI95%: 7.1%-9.9%). Level: 1 dose: 17% (CI95%: 14.6%-19.7%). Level: 2 doses: 74% (CI95%: 71.4%-77.3%).
2	Yount, 2003[197]	Cross-sectional .	Two Governorates Linkages Survey 1995-1997, children <5 years with diarrhoea in past 2 weeks in 12 rural villages of Minia governorate, n=129 children, 152 episodes of care-seeking. SEP: Confounder in analysis of gender.	**IO**: **Maternal education** (binary). **HH: Major asset ownership** (binary).	If reported symptoms of diarrhoea: **Type of provider sought** (episodes, n=152). Other:15%, Lay:16%, Pharmacist: 40%, Doctor: 29%. **Location of care** (episodes, n=152). Other: 28%, Public:12%, Private: 21%, Pharmacy: 39%. **Cost of care** (children, n=129). Free, ≤ 1 EPG, > 1 EGP (Proportions by category not provided, but median expenditure for boys 0.5 EGP, girls 0.2 EPG).
3	Yount, 2004[198]	Cross-sectional	Two Governorates Linkages Survey 1995-1997, Minia governorate, children <5 years of age of currently married women who were sick in 2 weeks before interview, n=1579. SEP: One of risk factors.	**IO: Mother's education level** (none, primary, preparatory, secondary and higher, **mother's ever-employment for cash** (binary), **mother's ownership of assets** (none, one, two or more), **father's years education** (none, 1-11, 12+). **HH: Number of assets/durables owned:** (none, low [1 asset/0-2 durables], medium [≤1 asset, 3+ durables], high [2+ assets]. (Assets include 6 items of means of transportation, land and building ownership; Durables are 10 household assets such as TV, fridge etc.)	If reported symptoms of illness (with diarrhoea, fever, cough or rash): **Utilized private treatment (private doctor).** Level: 18.8%.
4	Fadel, et al. 2007[199]	Prospective cohort	257 healthy infants (0-9 months) followed for 12 months (October 1999-October 2000) in Assiut university primary health center catchment area, n=631 diarrhoeal episodes. SEP: One of risk factors.	**IO: Mother's education**, **father's education** (illiterate, literate/primary, preparatory, secondary, university/higher), **mother's employment status** (binary). **HH: TV ownership** (binary), **Radio ownership** (binary).	If reported symptoms of diarrhoea in preceding 2 weeks: **Sought any treatment** (caretakers of children sought medical care outside the home). Level: 53.1% of diarrhoeal episodes (335 of 631). **Utilized private treatment** (medical care not under government control). Level: 37.3% of diarrhoeal episodes for which care was sought (210 of 335).
5	Gwatkin, et al, 2007[183]	Cross-sectional	EDHS 1995, 2000 (children under 5 years), n immunization: 1995=2085, 2000=2170; treatment for ARI: 1995=2479, 2000=1032; treatment for fever: 1995=4295, 2000=1923; treatment for diarrhoea: 1995=1701, 2000=771. SEP: Main determinant.	**HH: DHS Wealth index quintile**	**Coverage of immunisations:** BCG: 1995: 94.7%, 2000: 99.3%. Measles: 1995: 89.2%, 2000: 96.9%. DPT(3 doses): 1995: 83.0%, 2000: 94.0%. Hepatitis B: 1995: 57.0%, 2000 not reported. Full basic: 1995: 79.1%, 2000: 92.2%. No basic (not received full basic): 1995: 2.5%, 2000: 0.2%. **Sought any medical treatment**. Fever: 1995: 47.6%, 2000: 35.1%. ARI: 1995: 61.7%, 2000: 66.0%. Diarrhoea: 1995: 47.5%, 2000: 46.3%. **Utilized private treatment**. Fever: 1995: 34.8%, 2000: 21.7%. ARI: 1995: 43.5%, 2000: 41.5%. Diarrhoea: 1995: 33.2%, 2000: 30.0%. **Utilized public treatment**. Fever: 1995:12.0% , 2000: 12.6%. ARI: 1995: 17.1%, 2000: 23.1%. Diarrhoea: 1995: 13.7%, 2000: 15.6%.

EDHS – Egypt Demographic and Health Survey EGP – Egyptian pound BCG – Bacillus Calmette–Guérin (TB) DPT- Diphtheria, pertussis (whooping cough) and tetanus. Measures of SEP: IO: Individual – other (spouse, mother, etc), HH: Household-level.

Table 3.5 Summary of results from articles on maternal health-seeking behaviour

#	Author, Year	Statistical method, type of analysis, effect estimate	Results and confounders (if applicable)
1	Abdel Houssein, 1997[186]	**Crude analysis:** Not reported. **Adjusted analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Pattern of attendance of ANC clinics:** Education (number of categories not reported): OR 1.42 (0.64-3.13), p=0.387. SEP (ref category not specified) OR 1.38 (0.75-2.56), p=0.302. **Confounders**: age group (<20, 21-29, 30+), parity (0, 1-4, 5+), knowledge about adequate ANC use, level of risk, and health belief model score.
2	Yassin et al., 2003[187]	**Crude analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Any ANC:** Maternal literacy (ref: literate) OR 3.3 (1.6-6.7), p<0.001. Maternal occupation (ref: unskilled worker) OR 0.8 (0.3-1.8), p>0.05. Paternal literacy (ref: literate) OR 3.1 (1.4-6.9), p<0.01. Paternal occupation (ref: unskilled worker) OR 1.8 (0.7-4.5), p>0.05. Land ownership (ref: yes) OR 3.6 (1.4-9.3), p<0.01. House ownership (ref: yes) OR 1.0 (0.3-3.5), p>0.05. Cattle ownership (ref: yes) OR 0.5 (0.3-1.1), p>0.05. Access to safe water OR 1.1 (0.6-2.2), p>0.05. Meat consumption (ref: <4 times/month) OR 0.9 (0.4-2.1), p>0.05.
3	Gwatkin et al., 2007[183]	**Crude analysis:** Concentration index (CoI)*. **Effect estimate:** Concentration index value.	**Any ANC by a medically trained person:** Women from households in lower quintiles were less likely to receive but CoI decreased from 0.2703 (p<0.05) in 1995 to 0.2028 (p<0.05) in 2000. **Multiple (3+) ANC visits:** Women from households in lower quintiles were less likely to receive multiple ANC visits, but CoI decreased from 0.3580 (p<0.05) in 1995 to 0.2614 (p<0.05) in 2000. **Delivery with skilled attendance:** Women from households in lower quintiles were less likely to deliver with skilled medical assistance, but CoI decreased from 0.2911 (p<0.05) in 1995 to 0.2189 (p<0.05) in 2000. **Delivery location: Public or Private facility:** Women from households in lower quintiles were less likely to deliver in private facilities (CoI1995: 0.4379, p<0.05; CoI2000: 0.3422, p<0.05) and in public facilities (CoI1995: 0.2472, p<0.05; CoI2000: 0.1708, p<0.05), both indexes decreased between 1995 and 2000. **Delivery location: Home:** Women from households in lower quintiles were more likely to deliver at home and gradient increased over time (CoI1995: -0.1630, p<0.05; CoI2000: -0.2457, p<0.05).
4	Khadr, 2009[195]	**Crude analysis:** Concentration index (CoI). **Effect estimate:** Concentration index value.	**Any ANC received**: Education: CoI value has remained the same (0.41) between 1995 and 2005 (p<0.001). Wealth: Decreased inequality from 0.50 (1995) to 0.45 (2005) but significant (p<0.001). **Regular ANC received**: Education: Decreased inequality from 0.49 (1995) to 0.39 (2005) but significant (p<0.001). Wealth: Decrease in inequality from 0.60 (1995) to 0.49 (2005) but significant (p<0.001). **Delivery with skilled attendance:** Education: Decrease in inequality from 0.41 (1995) to 0.37 (2005) but significant (p<0.001). Wealth Decrease in inequality from 0.55 (1995) to 0.47 (2005) but significant (p<0.001). **Home delivery:** Education: Decrease in inequality from -0.42 (1995) to -0.35 (2005) but significant (p<0.001). Wealth: Decrease in inequality from -0.53 (1995) to -0.47 (2005) but significant (p<0.001).
5	Chiang et al., 2012[188]	**Crude analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Regular ANC:** Maternal education (ref: no primary education) OR 5.59 (2.98-10.47), p<0.01. Cash income (ref: no) OR 0.52 (0.25-1.09), p>0.05. Husband education (ref: ≤primary) OR 2.31 (1.26-4.23), p<0.01. **Delivery with skilled medical professional:** Maternal education (ref: no primary education) OR 2.98 (1.36-6.54), p<0.01. Cash income (ref: no) OR 0.79 (0.34-1.85), p>0.05. Husband education (ref: ≤primary) OR 2.38 (1.05-5.36), p<0.05. **Delivery in a health facility:** Maternal education (ref: no primary education) OR 5.42 (2.78-10.57), p<0.01. Cash income (ref: no) OR 0.51 (0.25-1.04), p>0.05. Husband education (ref: ≤primary) OR 2.82 (1.46-5.42), p<0.01.
6	Stephenson et al., 2012[185]	**Crude analysis:** Not reported. **Adjusted analysis:** Multi-level logistic regression. **Effect estimate:** Odds ratio.	**Any ANC received**: OR 1.0 (1.0-1.0), p>0.05. **Regular ANC received**: OR 1.0 (1.0-1.0), p>0.05. **First ANC in 1st trimester:** OR 1.0 (1.0-1.0), p>0.05. **Delivery in a health facility:** OR 1.0 (1.0-1.0), p>0.05. **Confounders**: Woman's age, marriage duration, partner age difference, death of a child, number of living children, sex ratio of children, education (woman and partner), employment status (woman and partner), household wealth, reproductive health knowledge, media exposure, violence justification, and decision-making autonomy.

*Values of standard error (SE) were provided by this study. Binary significance levels (<0.05, >0.05) were calculated by multiplying the SE by 1.96 to obtain the upper and lower confidence intervals.

Table 3.6 Summary of results from articles on child health-seeking behaviour

#	Author, Year	Statistical method, type of analysis, effect estimate	Results and confounders (if applicable)
1	Reichler et al., 1998[196]	**Crude analysis:** T-test. **Effect estimate:** Risk difference.	Children in households with a radio were more likely to have **received 2 doses** (77%) than one (69%) or no doses of OPV (72%), p<0.01. Children in households with a TV were more likely to have received 2 doses (94%) than one (86%) or no doses of OPV (84%), p<0.001.
2	Yount, 2003[197]	**Crude analysis:** Not reported. **Adjusted analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Type of provider**: Household assets (ref: none) Any: Pharmacist OR 1.78 (p>0.05), Doctor OR 2.46 (p>0.05). Maternal education (ref: none) Any: Pharmacist OR 2.10 (p>0.05), Doctor OR 0.75 (p>0.05). **Location of care**: Household assets (ref: none) Any: Public OR 3.65 (p>0.05), Pharmacy OR 2.01 (p>0.05), Private OR 2.20 (p>0.05). Maternal education (ref: none) Any: Public OR 0.66 (p>0.05), Pharmacy OR 2.09 (p>0.05), Private OR 0.72 (p>0.05). **Cost of care** (categorical variable, 3 levels): Household assets (ref: none) Any: OR 0.76 (p>0.05). Maternal education: not reported. **Confounders**: child gender and age; severity, cause and duration of diarrhoea; presence and gender of siblings; and family members' involvement in decision-making.
3	Yount, 2004[198]	**Crude analysis:** Not reported. **Adjusted analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Odds of utilizing private treatment:** Father's education (ref: 0 years): 1-11 years OR 0.84 (p>0.05); 12+ years OR 1.10 (p>0.05). Maternal ever-employment (ref: no): Yes: OR 0.79 (p>0.05). Maternal education (ref: none): Primary/preparatory: OR 0.81 (p>0.05), secondary or more: OR 0.92 (p>0.05). Maternal assets (ref: none): One OR 0.74(p<0.05), Two or more: OR 0.79 (p>0.05). Household assets/durables (ref: none): Low: OR 1.84 (p<0.01), Medium: OR 2.55 (p<0.001), High: OR 3.62 (p<0.001). **Confounders**: child gender and age; severity, cause and duration of illness; presence and gender of siblings; religion; urban/rural residence; maternal social resources and social constraints; and proximity of health services.
4	Fadel, et al. 2007[199]	**Crude analysis:** X^2 test. **Adjusted analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Crude analysis - Utilized treatment:** Mother's education p=0.285, Father's education p=0.339, Mother's employment status p=0.486, TV ownership p=0.042 (diarrhoeal episodes where households have TV more likely to utilize care), Radio ownership p=0.196. **Utilized private providers, if utilized treatment:** Mother's education p<0.001 (higher levels of education are more likely to utilize private providers), Father's education p=0.020 (higher levels of education are more likely to utilize private providers), Mother's employment status p<0.001 (working mothers are more likely to utilize private providers), TV ownership, Radio ownership: not reported. **Adjusted analysis - Utilized treatment:** Mother's education, Father's education, Mother's employment status, Radio ownership: not reported. TV ownership (ref: not clear) OR 0.63, p=0.418. **Confounders**: Perception of severe attack, vomiting, bloody stool, fever, duration of episode, age of infant, frequency of stool, presence of cough, associated any symptoms with diarrhoea, watery stool, history of child death, presence of preschool children, using self-prescribed drugs. **Utilized public versus private providers:** Mother's education (ref: illiterate): reads/writes/primary: OR 0.04 (p<0.001), preparatory: OR 0.02 (p<0.001), secondary: OR 0.04 (p<0.01), university/higher: OR 0.07 (p<0.01). Father's education (ref: illiterate): reads/writes/primary: OR 2.04 (p=0.212), preparatory: OR 1.27 (p=0.726), secondary: OR 0.82 (p=0.785), university/higher: OR 1.93 (p=0.209). Mother's employment status (ref: not working): working: OR 0.61 (p=0.278). TV ownership, radio ownership: not reported. **Confounders**: age and sex of infant, mother's age and mother's perception of diarrhoeal episode severity.
5	Gwatkin, et al, 2007[183]	**Crude analysis:** Concentration index (CoI)*. **Effect estimate:** Concentration index value.	**Coverage of immunisation:** BCG: Children from lower quintiles less likely covered, CoI decreased from 0.0317 (p<0.05) in 1995 to 0.004 (p<0.05) in 2000. Measles: Children from lower quintiles less likely covered, CoI decreased from 0.058 (p<0.05) in 1995 to 0.009 (p<0.05) in 2000. DPT: Children from lower quintiles less likely covered, CoI decreased from 0.0691 (p<0.05) in 1995 to 0.0022 (p>0.05) in 2000. HepB: Children from lower quintiles less likely covered, 0.0984 (p<0.05) in 1995, no 2000 estimate. Full basic: Children from lower quintiles less likely covered, CoI decreased from 0.0819 (p<0.05) in 1995 to 0.0052 (p>0.05) in 2000. No basic: Children from lower quintiles more likely to have no coverage, CoI decreased from -0.7434 (p<0.05) in 1995 to -0.7212 (p>0.05) in 2000. **Sought any treatment**: Fever: Children from lower quintiles less likely to receive, CoI decreased from 0.1076 (p<0.05) in 1995 to 0.077 (p<0.05) in 2000. ARI: Children from lower quintiles less likely to receive, CoI decreased from 0.0965 (p<0.05) in 1995 to 0.0897 (p<0.05) in 2000. Diarrhoea: Children from lower quintiles less likely to receive, CoI increased from 0.0357 (p<0.05) in 1995 to 0.0688 (p<0.05) in 2000. **Utilized private provider:** Fever: Children from lower quintiles less likely to receive, CoI increased from 0.1609 (p<0.05) in 1995 to 0.1928 (p<0.05) in 2000. ARI: Children from lower quintiles less likely to receive, CoI increased from 0.1543 (p<0.05) in 1995 to 0.1932 (p<0.05) in 2000. Diarrhoea: Children from lower quintiles less likely to receive, CoI increased from 0.1095 (p<0.05) in 1995 to 0.1713 (p<0.05) in 2000. **Utilized public treatment**: Fever: Children from lower quintiles more likely to receive, CoI increased from -0.0411 (p>0.05) in 1995 to -0.1240 (p<0.05) in 2000. ARI: Children from lower quintiles more likely to receive, CoI increased from -0.0469 (p<0.05) in 1995 to -0.0892 (p<0.05) in 2000. Diarrhoea: Children from lower quintiles more likely to receive, CoI decreased from -0.1446 (p<0.05) in 1995 to -0.1180 (p<0.05) in 2000.

*Values of standard error (SE) were provided by this study. Binary significance levels (<0.05, >0.05) were calculated by multiplying the SE by 1.96 to obtain the upper and lower confidence intervals.

Table 3.7 Risk of bias in included articles

	Health-seeking behaviour	Maternal						Child				
Risk of bias category	**Study**	Abdel Houssein, 1997	Yassin, 2003	Gwatkin, 2007	Khadr, 2009	Chiang 2012	Stephenson, 2012	Reichler, 1998	Yount, 2003	Yount, 2004	Fadel ,2007	Gwatkin, 2007
Selection	Representativeness (consecutive or obviously representative)	-	?	+	+	?	+	+	?	?	?	+
	Missing data or loss to follow up minimal	?	?	+	+	?	+	?	?	?	?	+
Exposure (SEP)	Clear definition of exposure	-	+	?	+	+	?	+	+	+	+	?
	Ascertainment of exposure	?	+	+	+	+	+	+	+	+	?	+
Outcome (HSB)	Clear definition of outcome	-	+	+	+	+	+	+	?	?	+	+
	Ascertainment of outcome	-	+	?	?	+	+	?	+	+	+	?
Analysis	Statistical test used to analyse the data is clearly described* and appropriate	+	+	+	+	+	?	+	+	+	+	+
	Minimal adjustment for age (maternal, child), parity (maternal) and gender (child)	+	-	-	-	-	+	-	+	+	+	-
	Correctly adjusting for several indicators of SEP	-	NA	NA	NA	NA	-	NA	-	-	-	NA

SEP – socio-economic position, HSB – health-seeking behaviour.
* Presenting a test of statistical significance was one of the inclusion criteria.
NA – not applicable (no adjusted analysis was conducted).
Key: + Low risk of bias, ? Potential/unclear risk of bias, - High risk of bias.

Section B. Mechanisms underlying socio-economic inequalities in health-seeking behaviours: Evidence from the 2008 Demographic and Health Survey

This second section of this thesis uses the most recently available nationally representative Demographic and Health Survey dataset collected in Egypt in 2008 to address objective 3. The section consists of three chapters. Chapter 4 provides background information about the 2008 DHS and details the methods used in the two subsequent results chapters. It includes the construction of latent variables capturing socio-economic position and statistical approaches used in analyses. In turn, Chapter 5 contains analysis of health-seeking behaviours related to maternal health and Chapter 6 discusses health-seeking for childhood illnesses.

4 DHS: Dataset and methods

4.1 Egypt Demographic and Health Survey 2008

4.1.1 DHS survey characteristics

The Demographic and Health Surveys (DHS) began in the mid-1980s and succeeded the World Fertility Surveys and the Contraceptive Prevalence Surveys. DHS have been conducted in more than 90 low- and middle-income countries to date.[200] DHS are sponsored by US Agency for International Development, implemented with technical assistance from Macro International and receive extensive country-level inputs on questionnaire design. Originally, the surveys were designed to measure basic demographic indicators of fertility levels and preferences, lifetime pregnancy history, contraceptive methods knowledge and use, and child health. In the intervening years, these surveys have expanded by adding detailed questions about women in reproductive age, their children and households, and several optional modules are available to collect data about men, gender-based violence, malaria indicators, female genital mutilation and biomarkers such as HIV and Hepatitis C virus. In addition to the detail and relevance of data collected, the methodological rigour and standardised fieldwork and data processing procedures have resulted in the DHS serving as one of the primary sources of information on reproductive, maternal and child health in low- and middle-income countries.[201]

Egypt has implemented six standard DHS rounds between 1988 and 2008, and a seventh occurred 2014 (datasets planned for release in mid-2015). The 2008 DHS was conducted with the approval of the Egyptian Ministry of Health and Population and implemented by El-Zanaty & Associates. This analysis used the 2008 datasets, which were collected between March and May of that year.[115] The sampling procedures reflected the objective to collect population indicators that are representative both on the national and regional levels. Six regions were identified: Urban Governorates (Cairo, Alexandria, Suez and Port Said), urban Lower Egypt, rural Lower Egypt, urban Upper Egypt, rural Upper Egypt and the Frontier Governorates). These indicators included fertility levels, contraceptive use, infant and child mortality, immunisation coverage, antenatal and delivery care use, maternal and child health, and nutrition. The sampling frame was based on the 2006 Egypt population census, which showed that the country's *de facto* population was 72.2 million.

A three-stage probability sampling design was used and aimed to reach a target of 19,500 households. In the first stage of selection, 610 primary sampling units (PSUs) were chosen and consisted of 275 urban towns *(shiakhas)* and 335 rural villages. Each selected PSU was divided into a number of segments equal in size and containing approximately 5,000 households. Depending on the size of the PSU, between one and three segments were selected into the sample, resulting in a total of 1,267 sampled segments. A complete household listing was conducted in each of the selected segments, after which the third stage involved using systematic random sampling to obtain the final sample of households. Three questionnaires were administered during the survey (household, ever-married woman and health issues). These questionnaires were based on model DHS surveys and earlier Egypt DHS questionnaires and administered to respondents in Arabic.[115] This thesis utilised data from the household and the woman questionnaires.

All 19,739 selected households were visited and re-visited to complete the survey, 99.1% (18,968) households were successfully interviewed. Upon completing the roster of household members, the enumerators interviewed all ever-married women in reproductive age (15-49 years old) who were usual residents in the household and present in the household on the night before the survey. From the 16,571 eligible women, interviews with 99.7% (16,527) were completed. The definitions and sizes of the samples of women and children on which the analysis in this thesis was based are presented in the respective chapters.

4.1.2 Ethics

The collection of the DHS was approved by the relevant authorities in Egypt and respondents' informed consent was sought. This secondary analysis of anonymised data was approved by the Research Ethics Committee of the London School of Hygiene and Tropical Medicine, UK (Appendix B).

4.1.3 Measurement of socio-economic position

Before elaborating on the methods used to construct the two variables of socio-economic position used in this thesis, I briefly outline the socio-economic position measures available from the DHS, their strengths and limitations, and conclude with a justification for creating two new variables for the purposes of this thesis.

4.1.3.1 Measures of socio-economic position on Demographic and Health Surveys

DHS questionnaires collect basic socio-economic characteristics of adult members of the household, female respondents, and the household unit as a whole. These items include education achievement (highest level of schooling completed, number of years of schooling), occupational and employment status of adult household members, ownership of various household goods, structural characteristics of the primary dwelling, access to utilities such as electricity and telephone networks, and the presence of productive assets (domestic animals and agricultural land). However, due to the complications related to eliciting reliable and valid information about the more detailed economic concepts, the DHS do not collect complete indicators of income, expenditure or consumption.[202,203]

In a recent article on measuring inequalities in the coverage of maternal and child indicators, Barros and Victora list five criteria that an ideal measure of socio-economic position would need to satisfy.[204] These criteria include reliability and validity of measurement, no rapid changes over time, ability to create (preferably equal) categories, and comparability across time and location. While no single measure can fulfil all criteria, a method of obtaining a relative measure of household wealth was proposed by Filmer and Pritchett.[205] For all surveys conducted since the early 2000s, DHS datasets contain a derived measure of household-level wealth constructed on the basis of household assets. This wealth index score is constructed from dozens of observed variables in each country by using principle component analysis (PCA). Sampled households are grouped into five equally-sized groups (roughly 20% of the sampled households in each) based on their wealth index score, thereby creating five wealth quintiles (WQ) – poorest, poor, middle, rich and richest. Each woman in the ever-married sample is assigned her household's wealth index score and quintile.

The general aim of PCA is to replace a (potentially large) number of correlated variables with a much smaller number of uncorrelated variables.[206] These uncorrelated variables are called principal components and are derived from the original set of variables so that the first principal component explains the maximum proportion of the total variance, the second the maximum possible of the remaining variance, and so on. The first component can also be thought of as the best one-dimensional continuous summary of the underlying observed data, and is used in DHS as the wealth index score. The full set of principal components (the total possible number of principal components equals the number of original variables) fully accounts for the total variance in the data. The strength of this data reduction technique is that

the first few principal components explain the majority of the variance in the underlying variables and can therefore be used in further analyses instead of the original variables. Additionally, because the principal components are uncorrelated, such analyses can be conducted in the absence of issues related to collinearity.[207]

PCA can be a useful method for creating measures of socio-economic position, particularly because it allows the underlying structure of the data to be examined. For example, in many countries, the DHS wealth index includes household ownership of a bicycle as a variable in the construction of the principal components. Households that own an asset would be considered wealthier than households that do not own that particular asset. However, principal component analysis may reveal that the principal component is negatively correlated with bicycle ownership (the component loading of bicycle ownership is negative). This relationship can be interpreted as meaning that, all else being equal, households that own a bicycle are *poorer* than households that do not own a bicycle. While such result might initially appear counterintuitive, this makes sense for example in contexts where bicycles are predominantly owned by rural households which are, on average, poorer than urban households.

The DHS wealth index has been a welcome addition to the datasets and is frequently used in published studies using DHS data. Its main advantage is that it makes use of a number of variables capturing ownership of assets and characteristics of living conditions. These component variables can be collected inexpensively on surveys (they are known to all adult household members, unlike, for instance, elements of consumption expenditure, which may occur outside the household) and used to create equally sized categories of wealth.[208] This measure of household wealth is also thought to be more stable overtime than other potentially time-varying (seasonal) indicators of household socio-economic position, such as income. Although the underlying constructs may not coincide, the DHS wealth index provides a more stable measurement of household-level resources than consumption expenditure.[205,209] The DHS wealth index on the 2008 Egypt DHS was calculated by using 79 binary household-level indicators (personal email correspondence with Dr. Shea Rutstein, October 1, 2012).

However, the absolute levels of the DHS wealth index scores are not directly comparable across countries, or within the same country across surveys conducted at different times. This is largely a result of including different observed variables in the PCA and varying component loadings. The main reason for this variability is because

over time and in various contexts, different assets and characteristics of households are correlated differently with one another. For example, in the early 2000s, all else being equal, ownership of a mobile phone may have differentiated between the fourth and fifth richest quintiles of households, but more recently in contexts where every household (and even every adult member of household) has access to a mobile phone, landline telephone connection may be a better predictor of higher wealth.

Further, socio-economic position has several conceptual dimensions. Although such dimensions are expected to be highly correlated, it is unclear which unobserved construct the DHS wealth index captures in Egypt. Asset-based indices, such as the DHS wealth index, most likely capture the dimension related to financial means and expenditure preferences. Assets may to some level reflect expenditure, but there is no information about the quality, number of people with access to them (intra-household allocation), decision-making processes surrounding their purchase, or the possibility that such items were inherited, gifted, loaned, financed by debt or exchanged in kind, rather than purchased with the household income.[206] Some assets included in the wealth index heavily rely on availability of utilities, such as water, sewerage and electricity connection. Ownership of assets requiring electricity (television, fridge) has been shown to exhibit geographic bias.[210] A household that has the financial resources and preferences to purchase a fridge, but lives in a remote area without reliable electricity supply may choose to invest such resources in other ways (informal loan, purchase of livestock). However, such alternative investments may not be considered in the construction of the wealth index, or, if they are, may carry a negative component loading. Although financially, this rural household may be better off than an urban household with an electricity connection and a fridge, this may not be correctly reflected on the household's wealth score. The wealth index may therefore partly be a proxy for residence (rural/urban),[211] and reflect more proximal determinants of health-seeking, such as availability of health care and geographical access to care, which limits its use as measure of socio-economic position in health equity research.[212]

This thesis aims to go beyond simply identifying socio-economic predictors of health-seeking behaviours. The systematic literature review of existing research in Egypt already showed that socio-economic position is positively associated with health-seeking behaviours for maternal and child care. While the direction of associations described in the literature are in the expected direction (positive), the evidence base is limited to small samples and crude analyses. To replicate such analyses would be

repetitive and would not provide additional insights into why such gradients exist in the Egyptian context. Only rigorous analytical strategies aiming to gain in-depth understanding of these reasons can lead to formulating successful policies to address the resulting gradients. While the scope for cross-sectional studies to provide causal inference to assess such reasons is limited, surveys such as the DHS provide the majority of population data on health-seeking behaviours in many low- and middle-income countries and it is imperative that their potential is explored. In this section, I propose to use the nationally representative DHS data to ask: Are women of higher socio-economic position in Egypt more likely to seek maternal and child care after adjustment for confounding? If so, is this because of their knowledge and preferences, or because they are able to financially afford care?

4.2 Construction of socio-economic position measures

In order to partition the effects of financial resources and knowledge/preferences, I did not use of the DHS wealth index and instead formally investigated the latent structure of the data. The characteristics required from the two latent measures of socio-economic position are that they should capture the sought constructs and rely on as few reliably observed variables as possible in order to generate an approximately normal distribution in the sample. I aimed to assess the measurement invariance between the DHS and the UECCTBS samples, and therefore started by using potentially useful observed variables available in both datasets.

To construct the two latent measures of socio-economic position, latent variable modelling was conducted in MPLUS software version 7.11 (Muthen&Muthen). Factor analysis is a method to reduce data dimensionality which examines the correlation of observed variables to identify unobserved (latent) factors.[213] This technique can be useful when it is impractical or impossible to observe a certain descriptive trait directly from the study subject. For socio-economic position, it is simple to ask survey respondents their highest educational level. However, it is not possible to directly observe or measure one's level of socio-cultural awareness or accumulated material means in a simple way. Factor analysis works by inferring the presence of latent factors which are responsible for the shared variance within a set of observed variables.

This approach has three strengths. By conceptualising the observed measurements as manifestations of a latent construct, it allows for multiple indicators of socio-economic position to be combined, and the strength of the association (factor loadings) estimated. Secondly, factor analysis/latent variable modelling, unlike PCA used in the DHS wealth

score, only measures common variance in the data, and variance that is not common, including random error, is disregarded from the latent summary. Thirdly, similarly to PCA, the latent variable approach reduces data while retaining a good representation within the latent variable(s) identified.[207,214] The continuous variables of socio-economic position constructed in this thesis represent latent constructs which underlie the "coarseness" of the observed binary or ordinal variables. The two-parameter measurement model included factor loadings (the strength of the association between the observed variable and the latent construct estimated in a probit regression) and thresholds (the level of the latent construct at which a particular binary or categorical observed variable is endorsed). [215]

Observed variables to include in the latent construct of socio-cultural capital were identified conceptually. The unobserved construct of socio-cultural capital was thought to be reflected on individual-level variables such as education and employment status of the woman and her husband. Education and literacy capture not only existing knowledge and access to information, but also cognitive skills, previous exposure to authority, and ability to interact with modern institutions such as schools and healthcare providers.[20,216-219] Additionally, women's education has been linked to effective negotiation of familial power structures.[219] Husband's education was considered because the education level of other decision-making members of the household are shown to influence health-seeking decisions through awareness of the benefits of skilled medical assistance during pregnancy and childbirth and support in seeking care.[216] The use of employment and occupational categories in low- and middle-income countries has been deemed problematic when the underlying construct is income, due to informal/unpaid work, and income level incommensurate to status (especially in the public sector).[194] However, in this thesis, employment status was thought to capture utilisation of attained education and exposure to wider social networks through workplace interactions, rather than serving as a proxy for income.

The construct of economic capital, similar to the DHS wealth index, is reflected on observed variables identifying material resources available on the household-level to meet the direct and indirect costs of care.[220] There were 19 observed binary variables capturing ownership of assets and living conditions that were available from both the DHS and the UECCTBS datasets. These variables described five dimensions: 1) utilities (electricity, piped water, flush toilet); 2) asset ownership (refrigerator, bicycle, motorcycle, car, mobile phone, land, colour television, water heater, automatic washing machine, non-automatic washing machine); 3) dwelling (dwelling owned, mud flooring,

cement flooring, wood/ceramic/carpet flooring); 4) service use (ownership of bank account); and 5) crowding (<1.5 people per bedroom in dwelling). However, a binary measure of asset ownership cannot capture potentially important variability in the quality of assets and their state of repair.[221] I attempted to minimise this potential source of error in the analysis by using the highest grade of asset (i.e., *colour* TV, *mobile* phone, *automatic* washing machine), but was unable to assess their functionality. One issue with such household-level economic resources variables is that it cannot be immediately assumed that women (or health-seeking decision-makers) have access to these household-level resources, in particular financial ones, that are thought to be reflected on the latent measure.

Confirmatory factor analysis was used to construct both continuous latent measures in the DHS sample of women with a live birth in the five-year recall period. This means that unlike the DHS wealth index, which is based on the entire sample of households in Egypt, the latent variables of socio-cultural capital and economic capital were only calculated for the sub-sample of female respondents. The analysis of health-seeking behaviours aims to examine socio-economic gradients among women who needed maternal care (i.e., those that had a live birth in the recall period). It is possible to construct latent variables of socio-economic position among all women in the sample. However, the analysis of the association between socio-economic position and maternal health-seeking based on all women would also have revealed socio-economic gradients in fertility. Because this thesis was not concerned with socio-economic gradients in fertility (i.e., the patterns in the need for maternal and child care), it was more practicable to construct these latent socio-economic position variables only in the sub-sample of women with a live birth in the recall period. Women with a living child are a further subset of this sample and both variables were therefore available for children <5 years.

Continuous latent variables capturing socio-cultural and economic capital were constructed in using the Weighted Least Squares, Mean and Variance adjusted (WLSMV) estimator, which is appropriate for binary/ordinal data and also for a combination of binary/ordinal data with continuous variables. Factor loadings capture the strength of the association between observed variables and the latent measure. In constructing the economic capital variable, only component variables with factor loadings >0.4 were retained, reducing the observed variables needed to achieve acceptable model fit to ten. Model fit was assessed with the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI) and the Root Mean Square Error of Approximation

(RMSEA). The latent scores were standardised to a mean of zero and standard deviation of one, which subsequently aided in the interpretation of the magnitude of associations with health-seeking behaviour. Proportion of missing data in the observed variables was minimal (<1% in any observed variable). The Full Information Maximum Likelihood (FIML) method was used and all observations with at least one non-missing value in the observed variables were included.[222] The goal of the FIML method of handling missing data is to identify the population parameter values that are most likely to have produced a particular sample of data. The discrepancy between the data and the estimated parameters can be quantified by this likelihood. In this full likelihood context, model parameters and standard errors are estimated directly from the available data and the selection mechanism is ignorable under the Missing at Random (MAR) assumption.

The resulting latent measurement models for both socio-economic position constructs had an acceptable fit to the data; the RMSEA level was ≤0.05 and the CFI/TFI ≥0.972 (Table 4.1).

Table 4.1 Goodness of fit criteria for latent variables

Latent variable	CFI	TLI	RMSEA
Socio-cultural capital	0.999	0.998	0.011
Economic capital	0.981	0.972	0.050

CFI - Comparative index fit (values>0.950 indicate good fit). TLI - Tucker Lewis index (values >0.950 indicate good fit). RMSEA - Root mean square error of approximation (values of <0.06 indicate good fit).

4.2.1.1 Socio-cultural capital

Socio-cultural capital reflects the marital couple's joint knowledge and access to information and their ability to discuss and agree upon actions to be taken in regard to health services utilisation for the woman's most recent pregnancy or child illness episode. The latent variable of socio-cultural capital was based on five variables: woman's education, her husband's education (continuous variable reflecting number of years spent in school), woman's literacy (illiterate, reads/writes with difficulty or reads/writes easily), husband's occupational category (not employed, unskilled manual, skilled manual, services, agriculturally employed, agriculturally self-employed, sales, clerical and professional), and the working status of the female respondent. The last variable was binary (rather than a categorical variable capturing the type of employment, as used for husband), because the large majority of respondents (87.1%) were not in employment. The distribution of the five observed variables and their factor loadings are shown in Table 4.2.

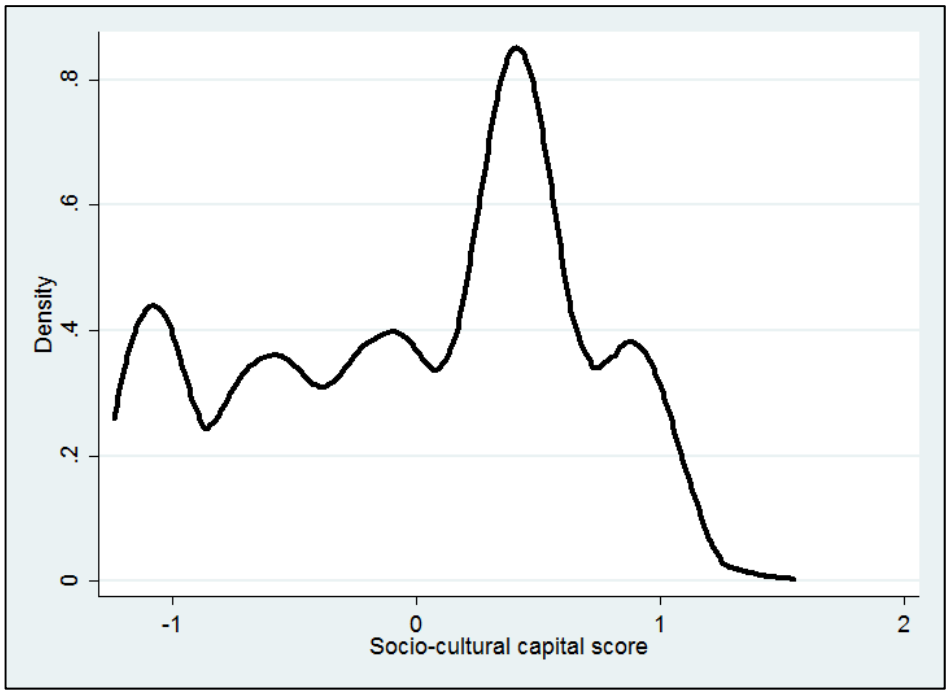
Table 4.2 Socio-cultural capital: component variables

Component variables	Distribution (n=7,896)	Standardized factor loading (SE)
Woman: Years of education		
Mean *(95% CI)*	8.3 (8.1-8.5)	0.74 (0.01)
Woman: Literacy		
Illiterate *(column %)*	27.5	0.71 (0.01)
Reads/writes with difficulty	6.6	
Reads/writes easily	65.8	
Missing	0.1	
Woman: Employment status		
Currently works (%)	12.8	0.30 (0.02)
Husband: Years of education		
Mean *(95% CI)*	9.0 (8.8-9.2)	0.89 (0.01)
Husband: Occupational category		
Not in employment *(column %)*	1.6	0.43 (0.01)
Unskilled manual	6.9	
Skilled manual	29.0	
Services	14.3	
Agriculture, employed	9.5	
Agriculture, self-employed	6.4	
Sales	3.3	
Clerical	3.7	
Professional	24.5	
Missing	0.8	

95%CI: 95% confidence interval SE: Standard error.
Complex survey design was accounted for in calculations of proportions, means and confidence intervals.

High scores on the latent variable represented high socio-cultural capital. The median standardised socio-cultural capital score was 0.139 (inter-quartile range [IQR]: -0.575 to 0.501), and it distribution is shown in Figure 4.1. An observation with a median socio-cultural capital score was described as a woman with six years of education, with difficulty reading and writing, not currently in employment, whose husband completed 12 years of education and was self-employed in agriculture.

Figure 4.1 Distribution of standardised socio-cultural capital scores



4.2.1.2 Economic capital

Household-level material resources available to meet the direct and indirect costs of care were captured by the economic capital latent variable.[220] The latent economic capital variable used the patterns of expenditure reflected in ownership of various assets and living conditions to assess current and past availability of financial resources. Its ten variables consisted of binary descriptive characteristics of the current living residence: utilities (water piped into dwelling, flush toilet), household ownership of assets (fridge, car, mobile, colour TV, water heater, automatic washing machine), ownership of a bank account, and level of crowding (Table 4.3). Crowding was calculated as the number of household members per bedroom, and dichotomized as being above or below the median level (1.5 members per bedroom) within the sample of women's households. High scores on the latent variable index of economic capital represented wealthier households.

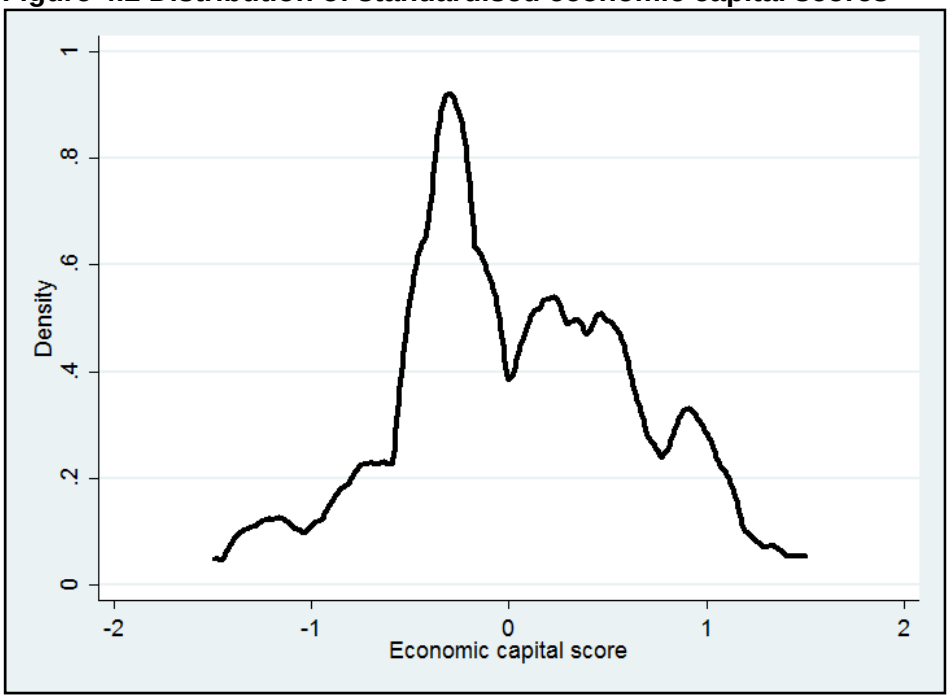
Table 4.3 Economic capital: component variables

Component variables	Distribution (n=7,896)	Standardized factor loading (SE)
Household utilities		
Piped water in dwelling *(%)*	90.1	0.46 (0.02)
Flush toilet *(%)*	44.4	0.89 (0.01)
Household asset ownership		
Refrigerator *(%)*	91.4	0.75 (0.02)
Car *(%)*	7.1	0.64 (0.02)
Mobile phone *(%)*	41.6	0.54 (0.01)
Colour TV *(%)*	89.0	0.64 (0.02)
Water heater *(%)*	35.4	0.90 (0.01)
Automatic washing machine *(%)*	18.5	0.91 (0.01)
Household service use		
Bank account *(%)*	7.1	0.61 (0.02)
Household level of crowding		
<1.5 persons/bedroom *(%)*	48.6	0.48 (0.01)

SE: Standard error. Complex survey design was accounted for in calculations of proportions.

The median economic capital score in the sample was -0.058 (IQR: -0.380 to 0.491). Its distribution is shown in Figure 4.2. The median economic capital score described a household which owned a fridge, a mobile phone, a colour TV, had a piped water connection, but did not own a car, a water heater, an automatic washing machine, a flush toilet in the dwelling, a bank account, and in which crowding was less than 1.5 persons per bedroom.

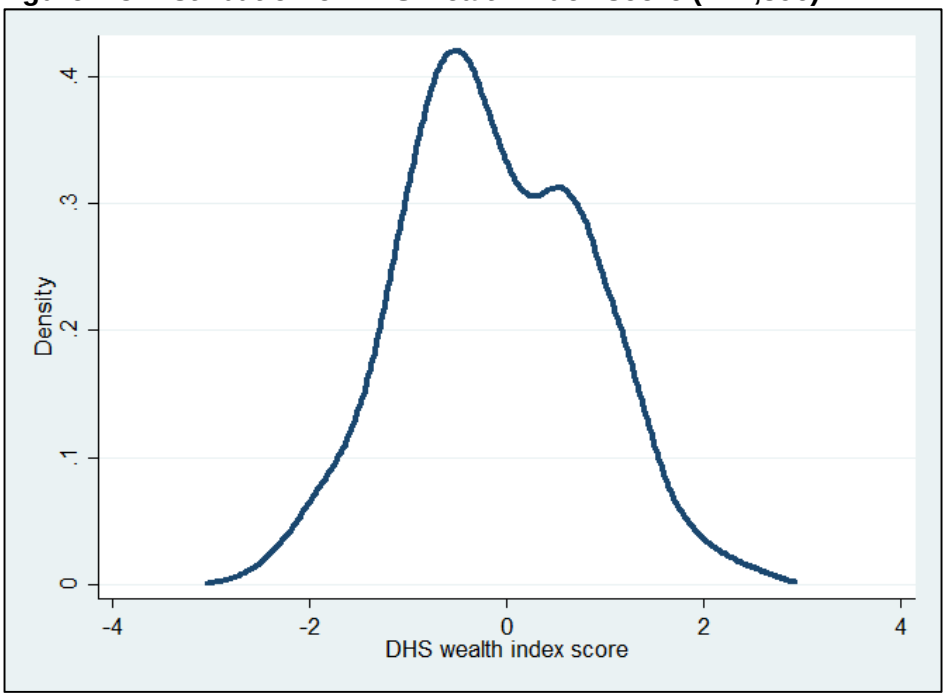
Figure 4.2 Distribution of standardised economic capital scores



4.2.1.3 Comparison of DHS wealth index score to economic capital

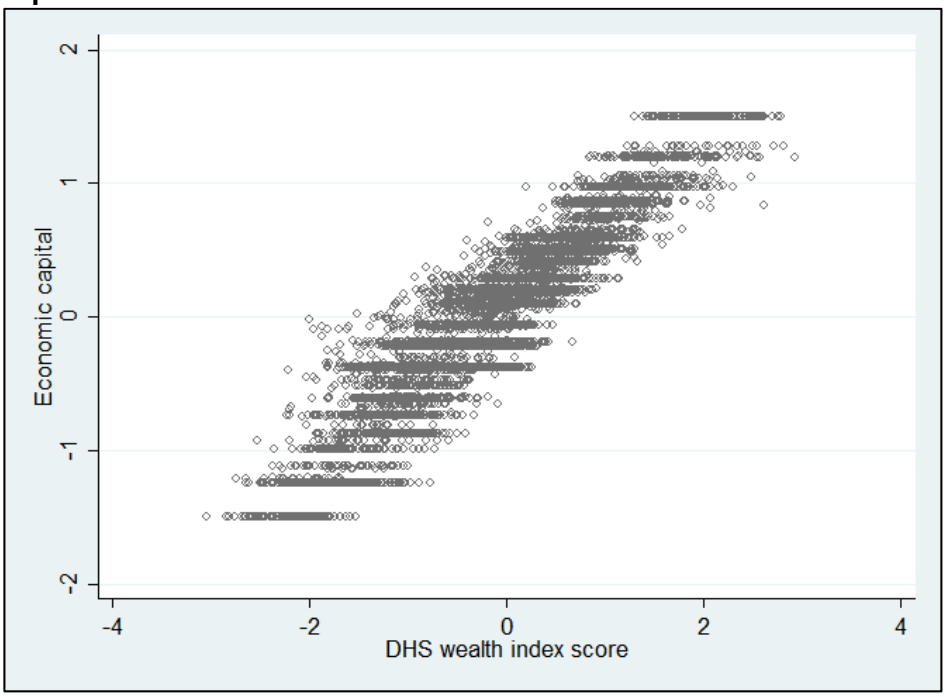
One important reason for constructing of the economic capital latent variable was to capture household-level availability of financial resources using as few variables as possible. The resulting latent variable of economic capital should essentially reflect the same construct as the DHS wealth index. Visual inspection of the histogram (Figure 4.2) showed that the distribution of economic capital was not as smooth as that of DHS wealth index score (Figure 4.3). This is expected since the latent variable used a dramatically reduced number of component variables (10 instead of 79) imposing greater limitation on the number of possible combinations – response patterns – of the observed variables.

Figure 4.3 Distribution of DHS wealth index score (n=7,896)



The correlation between economic capital and DHS wealth index score was examined to investigate the strength of the linear relationship between them. The Pearson's correlation coefficient of 0.931 ($p<0.001$) showed that there was a strong positive linear relationship between the two variables (Figure 4.4), confirming that they captured the same construct. The two assumptions for the test of the null hypothesis that the correlation coefficient is zero (at least one variable is normally distributed and the variables have a linear relationship) were met.

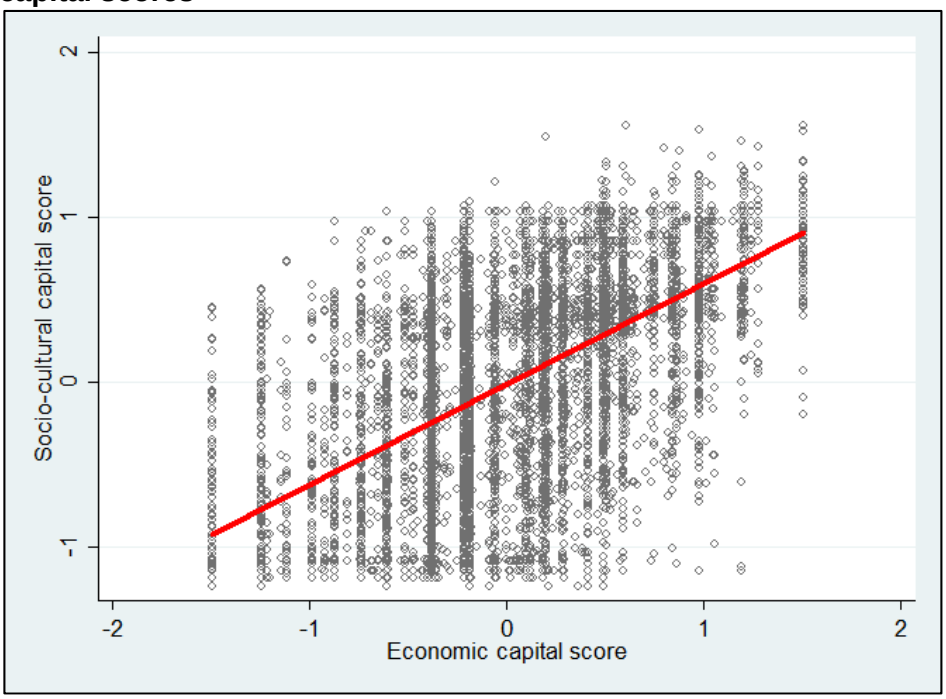
Figure 4.4 Correlation between DHS wealth index score and economic capital



4.2.1.4 Socio-cultural capital and economic capital: how are they related?

A crude linear regression was specified to examine the nature of the relationship between socio-cultural capital and economic capital. Based on the conceptual approach for mediation analysis, I considered socio-cultural capital to be the predictor variable and economic capital the independent variable.

Figure 4.5 Association between socio-cultural capital and economic capital scores



The result (shown in Figure 4.5) showed that there was a significant positive relationship (p-value of the regression coefficient for economic capital <0.001) between the two variables, which can be expressed with the following linear equation:

*Economic capital score = 0.025 + (0.53 * Socio-cultural capital score)*

The proportion of the variation in economic capital scores that was explained by changes in socio-cultural capital scores (R-squared) was 32.5%. This means that while socio-cultural capital was a strong predictor of economic capital scores, the two variables were not correlated perfectly and seemed to tap into two different latent constructs.

4.3 Statistical Analysis

Socio-cultural capital and economic capital continuous factor scores were estimated in MPLUS based on the selected CFA model and merged into the DHS dataset using unique identifiers of women's records to match records. All further descriptive, multivariable and mediation analyses were conducted in Stata/SE v13 (College Station, Texas, USA). Because the DHS used a multi-stage sampling procedure to select households to participate in the survey, these characteristics of the survey methodology needed to be accounted for in calculating point estimates and standard errors. The *svyset* command was used and included clusters (1,267 segments), strata (six geographical subdivisions) and individual sampling weights.

Sampling weight, or the inverse of the probability of being included in the sample, was provided by the DHS and calculated based on the sampling design and other factors, such as survey non-response. The weight available for each woman in the dataset was derived from the weight of her household multiplied by the individual response rate of her individual response rate group. The final weights were standardized so that the sum of the standardized weights was equal to the number of observations in the sample.[223] The raw weight values available in the dataset were transformed into a number with five decimal places by dividing the original value by 1,000,000. The sampling weights in the dataset ranged from the minimum of 0.186568 in the most oversampled women to a maximum of 1.746685 in the most undersampled group. Each analysis command was preceded by *svy* or *svy,(subpop)*.[224] All sample sizes presented in descriptive and multivariable analysis results were weighted sample sizes.

The samples used in the two results chapters (5 and 6) originated in the full sample of ever-married women in reproductive age who had a live birth in the five-year survey recall period. This sample was used to construct the two socio-economic position latent variables and therefore the resulting factor scores represent the distribution of socio-economic position in the population of women in need of maternal care in the recent past. In the analysis of maternal health-seeking behaviour, dimensions of behaviour surrounding the most recent live birth in the recall period was examined. Questions related to antenatal care were only asked about the most recent live birth, whereas circumstances surrounding delivery care were captured for all live births in the recall period. While theoretically, it would have been possible to analyse antenatal care health-seeking for the most recent birth and delivery health-seeking behaviours for all live births in the recall period, the latter sample would allow several entries per woman (i.e., birth-based analysis) and the results from the two analyses would not pertain to the same number of births and therefore not be directly comparable. Additionally, since the DHS survey was conducted in 2008 and the recall period spanned to 2003, I decided to analyse the most recent birth in the recall period for all maternal health-seeking behaviours to capture women's most recent behaviours and choices.

Consequently, the results were not representative of all live births in the five-year period preceding the survey and may have underestimated the behaviours and characteristics of women with higher fertility (women with more than one birth during the recall period). The total fertility rate in Egypt recorded on the 2008 DHS was 2.7 for the richest quintile and 3.4 in the poorest wealth quintile.[115] Therefore, behaviours of women in lower socio-economic position may have been underestimated in this woman-based analysis. However, other approaches are more appropriate for examining health-seeking among women with two or more births in the recall period.[225] One such approach might assess the extent of differences in health-seeking behaviours between the various pregnancies and deliveries and attempt to understand the reasons behind these changes.[226] The chapter assessing health-seeking behaviour for childhood illnesses includes all children born to the original sample of ever-married women in reproductive age during the five-year recall period (therefore all children are <60 months of age). It was therefore representative of all children in the five-year age group.

4.3.1 Descriptive analyses

In the descriptive section of each results chapter, proportions of the sample by category (for categorical variables such as age group and parity), means and standard errors (for continuous variables) were calculated. When several sub-samples were analysed, χ^2 (for binary and categorical variables) and t-test (for continuous variables) p-values were provided to test whether the difference in the distributions/means between the groups were statistically significant.

4.3.2 Multivariable regression models

Multivariable regression models were used to examine the direction and magnitude of association between the dependent variables (binary health-seeking behaviours) and two main explanatory variables (latent continuous socio-economic position variables), adjusted for potential confounders. The estimate of effect was an odds ratio (OR), which compared the odds of the outcome occurring among those exposed to the odds of it occurring among those that were not exposed. An odds ratio of 1.0 therefore indicated that the outcome was equally likely to occur between the exposed and the unexposed. An odds ratio higher than one meant that the outcome was more likely among those who were exposed and inversely, an odds ratio of <1 showed that the effect of exposure was protective, i.e., that the outcome was less likely among those with exposure than among those free of exposure.

Because the outcomes in this thesis are relatively common, the odds ratios estimates are not expected to approximate risk ratios. In studies of common outcomes, the property of odds ratios called symmetry is an attractive attribute of this measure of association. This characteristic means that the odds ratio for the outcome “Y” is the inverse of the odds ratio for outcome “not Y”; and the choice of outcome (Y or not Y) is therefore not important. Odds can range from 0 to infinity, and this is a convenient property which allows for logistic regression modelling (unlike risks, which can only range from 0 to 1). However, the use of odds ratios has a disadvantage compared to risk ratios – a limitation on interpretation due to non-collapsibility. In a situation when adjustment is made for a variable that is not a confounder, a risk ratio will not change. However, this does not apply to the odds ratio, which will be closer to 1 than the ratio change in average odds, and therefore cannot be interpreted as either the ratio change in average odds due to exposure among the exposed, or as the average in odds among exposed individuals.[227,228]

Logistic regression uses log-likelihood function to estimate parameter values. The data (observations) are treated as fixed and the model estimates parameter values that maximise the likelihood function. Maximum likelihood estimate and its variance is estimated from the log-likelihood function.[229] Logistic regression does not make any assumptions of normality, linearity, and homogeneity of variance for the independent variables. However, the relationship between outcome and predictor variable should be linear on the logit scale and the independent variables must not be linear combinations of each other.[230] The results of logistic regression models conducted in this thesis show odds ratios, 95% confidence intervals and the associated Wald test p-value. For binary and categorical covariates, this p-value indicates the probability that the null hypothesis of no difference between the logodds in the category being compared with reference to the baseline group. For continuous variables, the null hypothesis of this test relates to a change in the logodds with one unit increase in the variable of interest. Wald test is the chi-square assessment of a parameter estimated by maximum likelihood, and is possible because maximum likelihood estimates based on a large number of observations approximate normal distribution.

The likelihood ratio (LR) test is an alternative (complementary) test to the Wald test, and is suited to evaluate the model fit of logistic models. The LR test compares two models with the same number of observations, and tests the null hypothesis that the difference in the log likelihood values between the models is zero. All else equal, a model with an additional explanatory variable will have a higher log likelihood values than a model without such additional covariate. However, the difference in the log likelihood might not be significant and therefore adding the particular covariate might present no significant improvement in model fit. For continuous and binary covariates, the value of the Wald test is equivalent to the value of the LR test, and the test p-value can be interpreted as such. The purpose of the analyses in this thesis was to explore the associations that existed between the main socio-economic position exposures and health-seeking behaviours, and also to comment on the direction and magnitude of associations in the various categories of other covariates in the model. This thesis did not aim to test whether including each covariate improved the model fit; rather it aimed to include the most important factors that could influence health-seeking behaviour outcomes, and to control for confounding as fully as possible. The interpretation of Wald test p-values suited this purpose better than LR test p-values.

There is no consensus about whether to use survey sampling weights in regression analysis.[231] The two key issues in considering whether to do so are the trade-off

between reducing bias but reducing efficiency, and the potential for model misspecification.[232] The situation under which sampling can introduce bias in regression estimates occurs if the sampling depends on the response variable when conditioned on all explanatory variables in the model. In other words, it occurs if the survey weights are associated with the outcome under investigation, when adjusted for confounding by other independent variables. While weighting the regression will remove this bias, it can result in a loss of efficiency (inflation of variances of coefficient estimators).[233] Deriving regression estimators that are survey-weighted can be interpreted as approximating the actual model in the underlying population. This thesis aimed to examine the associations between socio-economic position and health-seeking behaviours that could be generalisable to the population of women and children in Egypt. In addition, the survey weights on the DHS were mainly based on geographic areas as it is likely that health-seeking behaviour outcomes varied based on contextual factors such as availability of care. Without the use of survey weights, bias may be introduced into the regression estimates and therefore this thesis used survey weights in logistic regressions. Where Stata did not allow the use of the *svy* command (i.e., the *medeff* command), I used the sampling weights alone.

4.3.3 Model building approach

The main objective of this analysis was to examine the magnitude of the association between socio-economic position and health-seeking behaviours and its importance, adjusted as fully as possible for the confounding by other factors. Multivariable logistic regression models were employed to determine whether socio-economic capital and economic capital were independently associated with the various dimensions of health-seeking behaviour, when adjusted for the effects of other variables that may confound this association. Factors that were *a priori* hypothesised to confound the association based on conceptual understanding of the association or on findings of previous research were identified. If these were available in the datasets, they were included in multivariable analyses estimating the association between the socio-economic exposures and the health-seeking behaviour outcomes. Due to the importance of these factors in the conceptual understanding of these associations, they were retained in final models whether or not their inclusion was a statistically significant improvement on the model as a whole.[234] An additional benefit of this approach was that the existence (or lack thereof) of an association between the included confounders (other independent variables) and outcomes of interest could be scrutinised and considered when interpreting the findings.

The practical implementation of this approach assumes that including these *a priori* confounders does not lead to problems with collinearity. In particular, the problem with logistic regression models is that formal diagnostics for collinearity cannot be computed. However, there are ways to gauge whether problems exist in specified models, since Stata would, by default, drop any variables that were perfectly collinear. Therefore, while collinearity is one reason why covariates identified *a priori* may need to be removed from multivariable models, this situation was not encountered in this thesis. Additionally, linear regression can be used to conduct informal diagnostics of collinearity and examined by using the postestimation Stata command *estat vif* (VIF, variance inflation factor). As a rule of thumb, VIF values >10 for a given variable merit further inspection and may signal that the variable could be considered a linear combination of other independent variables in the model. All final multivariable models in the quantitative results chapters (5, 6 and 8) were checked using this command and no issues with collinearity were identified (no VIF>2 was found).[235] Last, due to inclusion of confounders identified *a priori,* I checked for any issues with separation. Complete separation occurs if an independent variable, or a set of independent variables predict the outcome completely. In such extreme case of complete separation, the logistic regression model in Stata would not converge. In the less extreme case of quasi-complete separation, the Stata *logistic* command issues a warning.[236] No issues with complete or quasi-complete separation were encountered.

4.3.4 Causal mediation framework

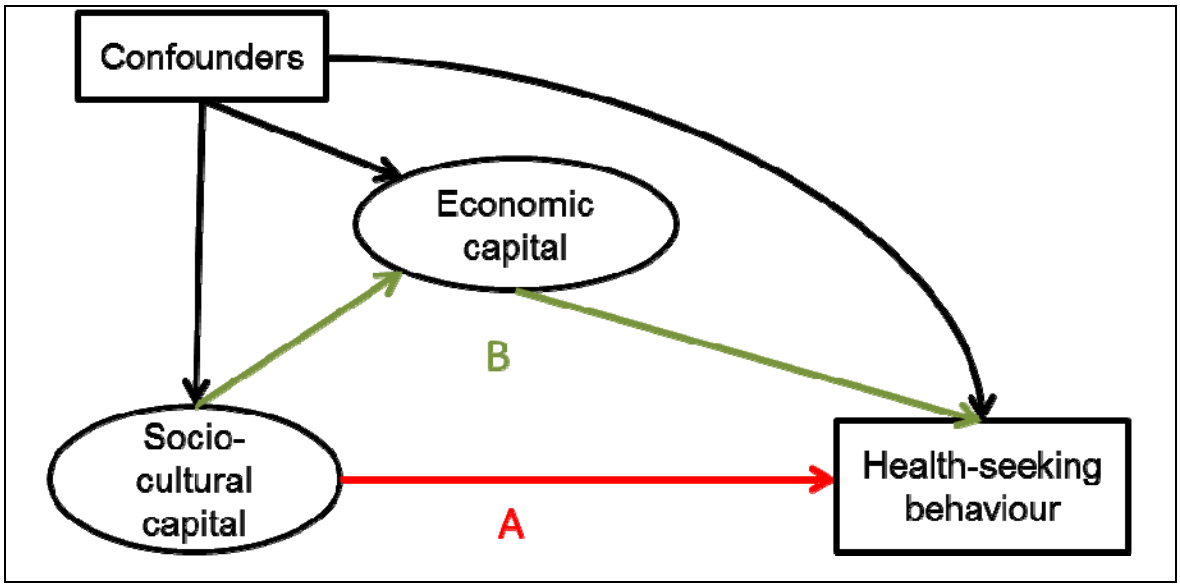
The best evidence of causal relationships is based on experiments randomising exposure status.[237] However, research of socio-economic inequalities in health and behaviour has faced a large obstacle in that experimental studies (i.e., randomising exposure to socio-economic position) would not be acceptable ethically and feasible practically. As discussed in the Introduction, observational studies show that lower (absolute and relative) socio-economic position is associated with worse health-seeking behaviours and poorer health outcomes. However, the causal interpretation of these findings cannot rely on experimental methods. While randomisation of exposure could confirm the existence of causality, it may be less useful in determining the various potential mechanisms underlying this association. With a few plausible assumptions, modern mediation methods can help assess the pathways which lead from an exposure to an outcome using observational studies. Such improved understanding of the pathways through which socio-economic position leads to the outcomes under

investigation can provide insights that are useful in setting short- and long-term policy and research objectives.

Mediation analysis belongs to the broader category of methods in causal inference. In this thesis, I used mediation analysis to partition the effects of socio-cultural capital that were directly associated with health-seeking behaviour outcomes under investigation from its indirect effects, mediated by economic capital. I used mediation analysis to assess the pathway-specific hypotheses, in an attempt to explain how the observed socio-economically-based inequalities in health-seeking behaviours arose.[238] Future research can benefit from this type of understanding by designing experiments that test the effect of interventions targeting the most important pathways of the association on reducing the extent of inequalities.

The conceptual mediation framework used in this thesis is presented as a directed acyclical graph in Figure 4.6. Latent variables of socio-cultural capital and economic capital are represented by oval shapes and observed health-seeking outcomes and confounders are in rectangular shapes. This figure represents the statistical expression of the mediation model, where the total effect of socio-cultural capital is the sum of its direct (A) and indirect (B, mediated by economic capital) components. The estimation of the natural direct effect involves examining the changes in the outcome when changing values of the exposure while keeping the value of the mediator at a certain level. On the other hand, the estimation the natural indirect effect is conducted by holding the value of the exposure at a certain level while examining the effect of changing the values of the mediator on the outcome. The sum of the direct and indirect effects is the total effect of the exposure. While the exposure and mediator states assumed in these counterfactual models are logically incompatible, they do rely on observed, rather than imputed, values of the two variables. This approach also allows for effect decomposition, but its correct specification relies on fulfilling the assumption that there is no unmeasured confounding in the exposure-outcome, exposure-mediator, and the mediator-outcome relationships.[239,240]

Figure 4.6 Mediation framework



The mediation models were specified in Stata using the command *medeff*.[241] Briefly, this command consists of two regression equations, with the presence of confounding variables, and a specification of the main exposure of interest and the mediator. The first of the two equations specifies the relationship between the main exposure (in this case, socio-cultural capital) and the mediator (economic capital). Both of these variables were entered in the models as continuous, and therefore linear regression is used. The second equation describes the association between the main exposure and the binary health-seeking behaviour outcome under investigation, expressed as a logistic regression. Both equations were adjusted for confounding.

The *medeff* command which was used for mediation analysis estimates the natural indirect effect employing counterfactual definitions as described in the causal mediation literature. The indirect effect is quantified after a series of Monte Carlo iterative simulations based on the observed data. As such, the model departs from path analysis which is only applicable to linear systems. Traditional indices of model fit, such as the RMSEA, CFI and TLI, cannot be mathematically formulated and are therefore not available within this framework.

Four steps underlie the structure of the algorithm for this command. Firstly, the two models (for the mediator variable and for the outcome variable) are fitted. Secondly, the algorithm simulates model parameters from their sampling distributions based on a quasi-Bayesian approximation of parameter uncertainty. In the example below, 1000 simulations are specified. Thirdly, the model parameters obtained during the second

step are used to simulate potential values of the mediator, which are then used to simulate the values of the outcome. Finally, direct and total effects are estimated for each simulation. In the fourth step, summary statistics, such as the average point estimates and their confidence intervals are calculated and presented.[241]

An example of the *medeff* command syntax used in analysis of the binary outcome whether antenatal care was received is:

```
medeff (regress economiccapital socioculturalcapital confounder1 confounder2
confounder3) (logit anyANC socioculturalcapital economiccapital confounder1
confounder2 confounder3) [pw=weight], treat(socioculturalcapital)
mediate(economiccapital) sims(1000) vce(cluster clustervariable)
```

The *medeff* command does not support the use of *svyset*, but allows for the use of survey weights. Therefore, in the results, I reported on the odds ratios and their 95% confidence interval (95%CI) and p-values from logistic regressions using *svyset*, which includes cluster, stratification and weights to be specified. The mediation models using the *medeff* command (with probability weights) were used to determine the total effect of socio-cultural capital and the proportion of the total effect mediated by economic capital. Additionally, clustering was accounted for by using the robust standard error estimator option *vce(cluster)* incorporated in the *medeff* command.

The first part of the output from the *medeff* command shows the results from the two regression equations (mediator-outcome and exposure-outcome). It is the second part of the output that is of interest, in that it estimates the total effect of socio-cultural capital (direct and indirect) and the proportion of the total effect mediated by economic capital. The total effect (and its 95% CI) is expressed as the sum of changes in probability of outcome ($\Sigma\Delta p$). This effect estimate can be interpreted as the change in the probability (not odds) of the outcome under investigation with one unit increase in the socio-cultural capital score. To take the *medeff* command specified above as an example, if the total effect of socio-cultural capital is estimated at 0.10, this means that a one unit increase in socio-cultural capital score is associated with a 10% increase in the probability of receiving antenatal care. In light of the difficulties interpreting odds ratios due to the property of non-collapsibility, this estimate of the total effect can aid in the interpretation of importance of the findings.

In the context of mediation, it is expected that a mediator will explain a part (or all) of the association between the exposure and the outcome, because it lies on the causal pathway between these two variables. However, this situation only occurs if the three

relationships in the mediation model (exposure-mediator, mediator-outcome, and exposure-outcome) are in the same direction. The significant positive association between the exposure (socio-cultural capital) and the mediator (economic capital) was shown in Figure 4.5. Whether or not economic capital is a mediator in the proposed conceptual framework therefore depends on the remaining two relationships. The possible scenarios are outlined in Table 4.4. If the association between the mediator and the outcome and the exposure and outcome are both positive, the proportion of the total effect of socio-cultural capital which is mediated by economic capital (and its 95% CI) can be estimated and ranges from 0% to 100% (Case 1 in Table 4.4). For the purpose of interpreting this estimate, a proportion between 0% and 50% would imply that the majority of the total effect of socio-cultural capital was direct. Conversely, a proportion above 50% signifies that most of this total effect was mediated by economic capital. Case 4 shows a scenario where the association between the mediator and the outcome is negative, as is the direct effect of socio-cultural capital. Similar approach was taken in this scenario as in Case 1.

However, if the direct and indirect effects of socio-cultural capital on the outcome have opposite directions of association, a situation of inconsistent mediation arises.[242] Specifically in the context of this thesis, such situation would occur if the association between the mediator and the outcome was positive (i.e., the indirect effect was positive), but the association between the exposure and the outcome was negative (the direct effect was negative), as shown by Case 2 in Table 4.4. It would also occur if the direct effect of socio-cultural capital was positive while the association between the mediator and the outcome was negative (Case 3 in Table 4.4). While the total effect of socio-cultural capital can be estimated in all four cases, the interpretation of the proportion of the total effect mediated by economic capital would only be relevant if the directions of the two associations were the same.

Table 4.4 Mediation analysis strategies according to direction of association between socio-cultural capital and the outcome and economic capital and the outcome

Association between mediator (economic capital) and outcome (health-seeking behaviour) – indirect effect	Association between exposure (socio-cultural capital) and outcome (health-seeking behaviour) - direct effect	
	Positive	*Negative*
Positive	**Case 1: Mediation** Mediation effect examined and total effect of socio-cultural capital was estimated. Proportion of the total effect of socio-cultural capital mediated through economic capital: 0% - 100%. If either the direct or the indirect effect are not significant at the p<0.05 level, it is possible that the association arose by chance.	**Case 2: Inconsistent mediation** Total effect of socio-cultural capital was estimated. If the total effect of socio-cultural capital was significant at p<0.05 level, the opposing directions of association were unequal in magnitude. - If the magnitude of the negative direct effect was larger, the total effect will be negative, but the mediation will have suppressed this effect. - If the positive indirect effect was larger, the magnitude of the total effect will be positive. In either scenario, the proportion of the total effect mediated through economic capital was marked as "0%." If the total effect of socio-cultural capital was not significant at p<0.05 level, meaning that the magnitude of the opposing associations (direct and indirect effects) was approximately equal, the proportion of total effect mediated through economic capital was not applicable, as the total effect was possible by chance.
Negative	**Case 3: Inconsistent mediation** Total effect of socio-cultural capital was estimated. If the total effect of socio-cultural capital was significant at p<0.05 level, the opposing directions of association were unequal in magnitude. - If the magnitude of the positive direct effect was larger, the total effect will be positive, but the mediation will have suppressed this effect. - If the negative indirect effect was larger, the magnitude of the total effect will be negative. In either scenario, the proportion of the total effect mediated through economic capital was marked as "0%." If the total effect of socio-cultural capital was not significant at p<0.05 level, meaning that the magnitude of the opposing associations (direct and indirect effects) was approximately equal, the proportion of total effect mediated through economic capital was not applicable, as the total effect was possible by chance.	**Case 4: Mediation** Mediation effect examined and total effect of socio-cultural capital was estimated. Proportion of the total effect of socio-cultural capital mediated through economic capital: 0% - 100%. If either the direct or the indirect effect are not significant at the p<0.05 level, it is possible that the association arose by chance.

The correct application of this causal framework relies on the validity of the assumption that socio-cultural capital temporally preceded economic capital and therefore contributed to the accumulation of economic capital being fulfilled. Economic capital was influenced by socio-cultural capital as well as by other factors and reflects the financial means and material consumption preferences generated by socio-cultural capital. Therefore, while certain components of economic capital could be caused by inherited wealth, socio-cultural capital (knowledge and preferences based on educational and occupational lived environment) contributed partially to the ways in which economic capital is utilised.

The second assumption in the estimation of natural direct effect related to unmeasured confounding. No unmeasured confounding should be present in the associations between the exposure and the outcome, between the exposure and the mediator, and between the mediator and the outcome. Additionally, no measured or unmeasured effect of the exposure should be present that confound the association between the mediator and the outcome (intermediate or post-treatment confounding).[243] While these assumptions are unverifiable, I discuss their plausibility and implications in the limitations section of each chapter.

An alternative method to the mediation approach I selected could consist of including socio-cultural capital and economic capital in a multivariable logistic regression model in a stepwise fashion, observing the change in the odds ratio associated with socio-cultural capital occurring as a result of inclusion of economic capital. This stepwise method conceptually assumes that economic capital confounds the association between socio-cultural capital and health-seeking behaviour outcomes, rather than mediates the effect of socio-cultural capital, and therefore estimates only the reciprocally adjusted effects of both these variables representing SEP. With *a priori* knowledge about the strong association between socio-cultural capital and economic capital (Figure 4.5), such approach can provide some intuition about the existence of mediation. However, the most important limitation of such approach is that the total effect (direct and indirect) cannot be formally estimated and therefore the proportion of the total effect which is mediated cannot be formally derived.

Having discussed the main disadvantage of the alternative approach to mediation, I would like to extend the consideration of confounding variables beyond that presented in the model building approach section. As stated above, the main assumptions of the mediation approach are those related to sequential ignorability; meaning that the

presence of unmeasured confounding biases the estimates. While keeping this assumption in mind, this thesis aimed to compare the magnitude of the direct and indirect pathways linking socio-cultural capital to health-seeking behaviours. As specified, all associations acting through pathways other than through economic capital were included in the estimate of the direct path. Therefore, inclusion of variables that may lie on one of these residual pathways would be detrimental to the objective of the analysis. To include such variables as confounders would result in removing their effects from the direct association.[244]

I approached the selection of confounding variables to include in the analysis carefully, balancing the need to account for the maximum confounding with the need to exclude from consideration variables on the direct path. By extension, variables that are part of the pathway between economic capital and health-seeking outcomes (indirect path) were also excluded from the models, as their inclusion might have incorrectly attenuated the total effect estimate. Health insurance is one example of a characteristic that fulfilled both these exclusion criteria (lied on the direct path from socio-cultural capital to health-seeking outcome and on the pathway between economic capital and the outcome). Elements of care received (e.g., particular components of antenatal care, delivery by caesarean section) were also excluded from consideration as confounders in the models because they were consequences of health-seeking behaviours (Figure 1.2 - Domain C).

5 DHS: Maternal health-seeking behaviours

This Chapter was presented at the European Population Conference in June 2014 in Budapest Hungary. It was published by BMC Health Services Research in January 2015 under DOI 10.1186/s12913-014-0652-8 (Appendix C).

5.1 Abstract

Background

The levels and origins of socio-economic inequalities in health-seeking behaviours in Egypt are poorly understood. This Chapter assessed the levels of health-seeking behaviours related to maternal care (antenatal care [ANC] and facility delivery) and their accumulation during pregnancy and childbirth. Secondly, it explored the mechanisms underlying the association between socio-economic position (SEP) and maternal health-seeking behaviours. Thirdly, it examined the effectiveness of targeting of free public ANC and delivery care.

Methods

Data from the 2008 Demographic and Health Survey were used to capture two latent constructs of SEP: individual socio-cultural capital and household-level economic capital. These variables were entered into an adjusted mediation model, predicting twelve dimensions of maternal health-seeking; including any ANC, private ANC, first ANC visit in first trimester, regular ANC (four or more visits during pregnancy), free public ANC care, facility delivery, private delivery, and free public delivery. Price of ANC and delivery care were examined among paying users separately by provider sector (public or private).

Results

While 74.2% of women with a birth in the five-year recall period obtained ANC and 72.4% delivered in a facility, only 48.4% obtained the complete maternal care package (timely and regular facility-based ANC as well as facility delivery). Both socio-cultural capital and economic capital were independently positively associated with receiving any ANC and delivering in a facility. The strongest direct effect of socio-cultural capital was seen in models predicting private provider use of both ANC and delivery. Despite substantial proportions of women using public providers reporting receipt of free care (ANC: 38%, delivery: 24%), this free-of-charge public care was not effectively targeted to the poorest women.

Conclusions

Socio-cultural capital was the primary mechanism leading to inequalities in maternal health-seeking in Egypt. Improvements in the targeting of free public care could help reduce the existing socio-economically-based inequalities in maternal care coverage in the short term. Future studies should examine the objective and perceived quality of care from different types of providers.

5.2 Introduction

Health-seeking behaviours comprise one of the direct pathways leading to the widely reported association between socio-economic position (SEP) and health outcomes.[18] Understanding the mechanisms underlying this association is crucial to devising effective interventions to reduce inequalities in health outcomes. Inequities in the coverage of maternal care interventions have gained prominence in light of Millennium Development Goal efforts to reduce maternal and neonatal mortality by 2015 and beyond.[89] In addition to deaths, maternal near-miss events and other complications resulting in morbidity and long-term disability also carry devastating effects on the lives of women, children and families in the form of physical, psychological and socio-economic sequelae.[73-75] Antenatal care (ANC) and delivery care can prevent maternal and perinatal deaths,[81] but their coverage relies on numerous complex factors such as availability and price of care, as well as women's utilisation of these services.

Egypt witnessed large decreases in maternal mortality in the last two decades; a decrease from 174 to 84 per 100,000 live births between 1992-3 and 2000 [151] and a further decline to 66 by 2010.[164] This reduction was most likely achieved through a combination of increasing ANC coverage, skilled birth attendance, improved quality of care, access to emergency obstetric care and fertility-reducing socio-economic development, in particular women's education.[152] Yet, in the five years before 2008, 78% of births to women with complete secondary or higher education were preceded by four or more ANC visits, but only 45% of births among women with no education were.[115] Physical access does not appear to present barriers to accessing care as 95% of Egypt's population live within 5km from the nearest health facility [245] and only 4% of maternal deaths in the 2000 maternal mortality study were classified as avoidable due to long distance to reach a hospital.[151] However, the existence of health care facilities may not necessarily translate into care which is available, acceptable, affordable and good quality. Substandard care and referral delays were implicated as the second most important preventable causes of maternal mortality in 2000.[151,246] The proportion of facility deliveries occurring in public facilities has steadily declined from 63% in 1992 to 27% in 2008.[115] This trend toward increasing private care utilisation may be a result of perceived and/or real quality of care deficits in the public sector.[4]

Socio-economic resources are well-established determinants of maternal care utilisation in low- and middle-income countries.[57,102]. In Egypt, important gaps in the understanding of the extent of socio-economic inequalities in maternal health-seeking behaviours remain.[247] Specifically, no study has presented an adjusted analysis of the association between socio-economic position and maternal health-seeking behaviour on a nationally-representative sample. Each separate dimension of maternal health-seeking behaviour (e.g., timing, frequency and price of care) may exhibit different direction and magnitude of association with SEP. A detailed understanding of the association between socio-economic position and the separate dimensions of health-seeking behaviour is required.

5.2.1 Objectives

This Chapter used the most recent nationally-representative survey conducted in Egypt in 2008 to assess the levels of maternal health-seeking behaviours and their accumulation throughout the process of health-seeking, reflected on the indicator of the complete maternal care package. Understanding whether inequalities in maternal health-seeking behaviours were a result of knowledge-related preferences or differences in access to financial resources is essential to designing effective interventions aimed at their elimination. Therefore, the second objective explored the mechanisms underlying the association between socio-economic position and maternal health-seeking behaviours in an adjusted mediation model to assess the direct, indirect (mediated by economic capital) and total (direct plus indirect) effects of socio-cultural capital on maternal health-seeking behaviours.[238,248] This innovative approach allowed me to quantify the association between the two dimensions of socio-economic position and health-seeking behaviour outcomes, and also to assess their relative importance. I examined the price paid for care and the effectiveness of targeting of free public ANC and free public delivery care to the most socio-economically vulnerable women.

5.3 Methods

5.3.1 Study sample

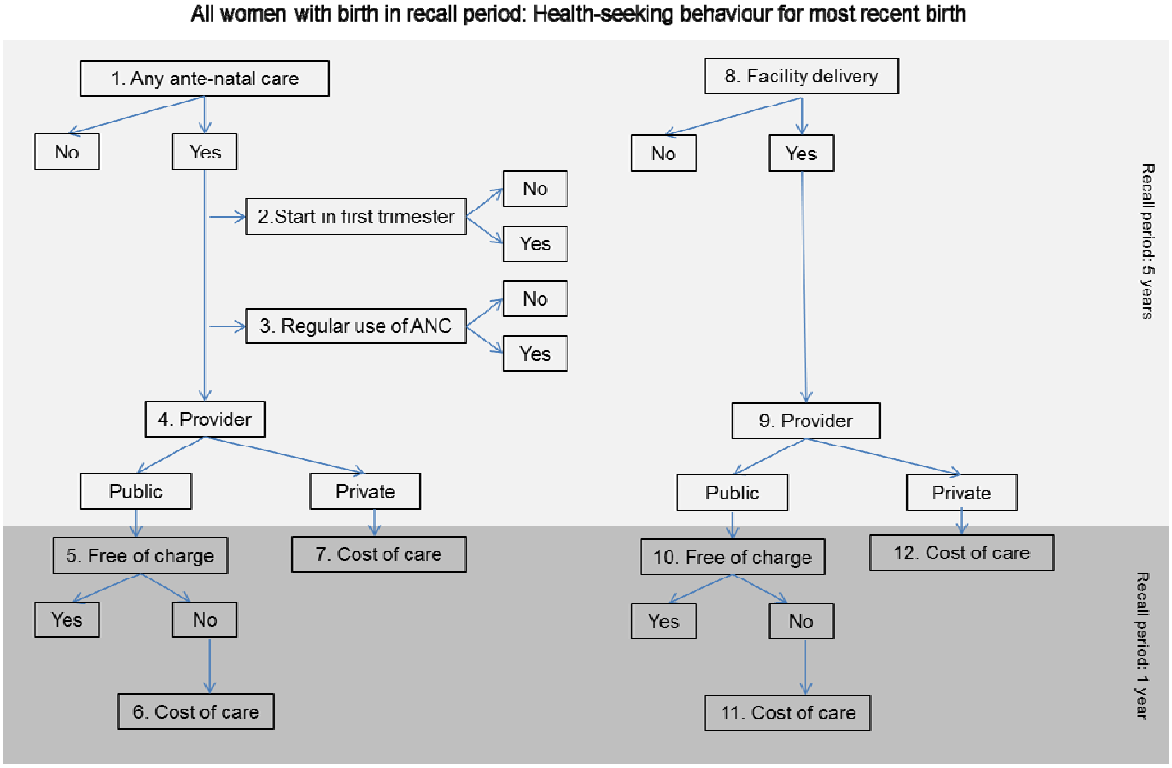
This analysis was based on a nationally-representative survey of ever-married women aged 15-49 from the 2008 Egypt Demographic and Health Survey (DHS). To examine health-seeking behaviours related to maternal care, behaviours surrounding the most

recent birth among women who reported having given birth in the five years preceding the survey were assessed. The price paid for care was assessed among the subsample of women whose most recent birth occurred in the twelve months prior to survey.

5.3.2 Exposures

The latent variables of socio-economic capital and economic capital were considered as independent (exposure) continuous variables. Additionally, economic capital was considered as a mediator of the association between socio-cultural capital and the health-seeking behaviour outcomes.

Figure 5.1 Dimensions of health-seeking behaviour for maternal care



5.3.3 Outcomes

Antenatal care

Seven dimensions of ANC utilisation for the most recent pregnancy were assessed (Figure 5.1). DHS datasets do not contain one binary variable capturing whether a woman received ANC during pregnancy or not. The 2008 Egypt DHS questionnaire contained several questions related to utilisation of ANC (questions and response options used in this Chapter are shown in Appendix D). These questions include where ANC was received, who provided the ANC, the month of pregnancy when first (and last)

ANC visits occurred, the total number of ANC care visits during the pregnancy, as well as questions eliciting whether specific elements of ANC were received (for example, whether the respondent was weighed, blood pressure taken, urine and blood tests conducted, and tetanus toxoid received). Therefore, various algorithms can be constructed to capture the proportion of births preceded by ANC when relying on raw DHS datasets.[99] Depending on which of these variables (or combinations thereof) is selected, different approaches may result in slightly different coverage estimates. I created a binary variable categorising women as having received facility-based ANC or not, based on the location(s) of ANC reported for the most recent live birth (Question 508). If ANC was utilised, three binary variables described its extent. Firstly, response to Question 510 assessed the timeliness of ANC (whether the first ANC visit occurred in the first trimester of pregnancy). Secondly, a binary variable capturing the regular use of ANC was constructed from responses to Question 509 (regular ANC was defined as four or more ANC visits during pregnancy). Thirdly, I used responses to Question 508 to generate a binary variable describing whether the provider of ANC was private or not.

Delivery care

Five variables described women's utilisation of institutional delivery care (Figure 5.1). First, a binary variable captured whether the most recent delivery in the recall period occurred in a domestic environment (woman's home or other home) or in a health facility (Question 543). Among the subset of women with facility deliveries, a binary variable based on the same question described whether the facility was private or not.

Provider type

The response options listed for location of ANC and delivery care were the same (Questions 508 and 543). For both services, women's detailed responses were descriptively analysed. Further, the responses were recoded to construct a binary categorisation of public or private providers. The definition of private providers included any facility-based providers outside of the government's purview, such as private hospitals, clinics, doctors, the Egyptian Family Planning Association, the Clinical Services Improvement (CSI) project, and other non-governmental organisation/private providers. Whereas for deliveries, only one location of care was described, women who received more than one ANC visit may have received care from various providers. However, only 2.1% of women who used ANC reported receiving care from a combination of public and private providers. For women who reported using multiple providers of ANC within one sector, the provider with the highest clinical capability was retained in descriptive analysis of location of ANC. Women who used both public and

private ANC providers were grouped together with women who used solely private providers as private ANC users. A skilled birth attendant (SBA) was defined as a doctor or nurse/midwife.

Price paid for care

The 2008 round was the first DHS in Egypt to collect data about the price paid for ANC and delivery care. While this information can provide useful insights into the burden of out-of-pocket expenditures, I approached the analysis of these data with additional constraints and considered it exploratory. Firstly, the DHS questionnaire collected responses about the price paid for care obtained for the most recent pregnancy/delivery, but the validity of women's recall of the amount paid for antenatal care in Egypt has not been established. The recall period could have been up to 60 months prior to the survey. I expect that women's ability to accurately report the price paid for care decreases with the length of time elapsed since the event. Therefore, I limited the analysis of price of care to births in the 12-month period before the survey. This shortened recall period also had the advantage of comparing prices paid for care in a shorter time span, with a more limited variability in prices. The average inflation rate in consumer prices in the period between 2003 and 2007 in Egypt was 7.5% annually,[249] and it is not unreasonable to expect that the prices of (especially private) care would have increased during the five-year period.

The second limitation of the analysis of price of care is the larger extent of missing data compared to the other dimensions of maternal health-seeking. Missingness was higher for price of delivery care than for antenatal care. Due to the various reasons given above, I chose not to include the prices paid for auxiliary care and services, such as laboratory tests and medications, in the analysis of price paid for care. The creation of variables for price of ANC and delivery care was conducted in two steps and was based on the type of provider women reported using. Firstly, among public provider users, I dichotomised women into paying and free users. Among observations with valid amounts paid for care, a continuous variable was created capturing the amount paid and analysed separately by sector.[250]

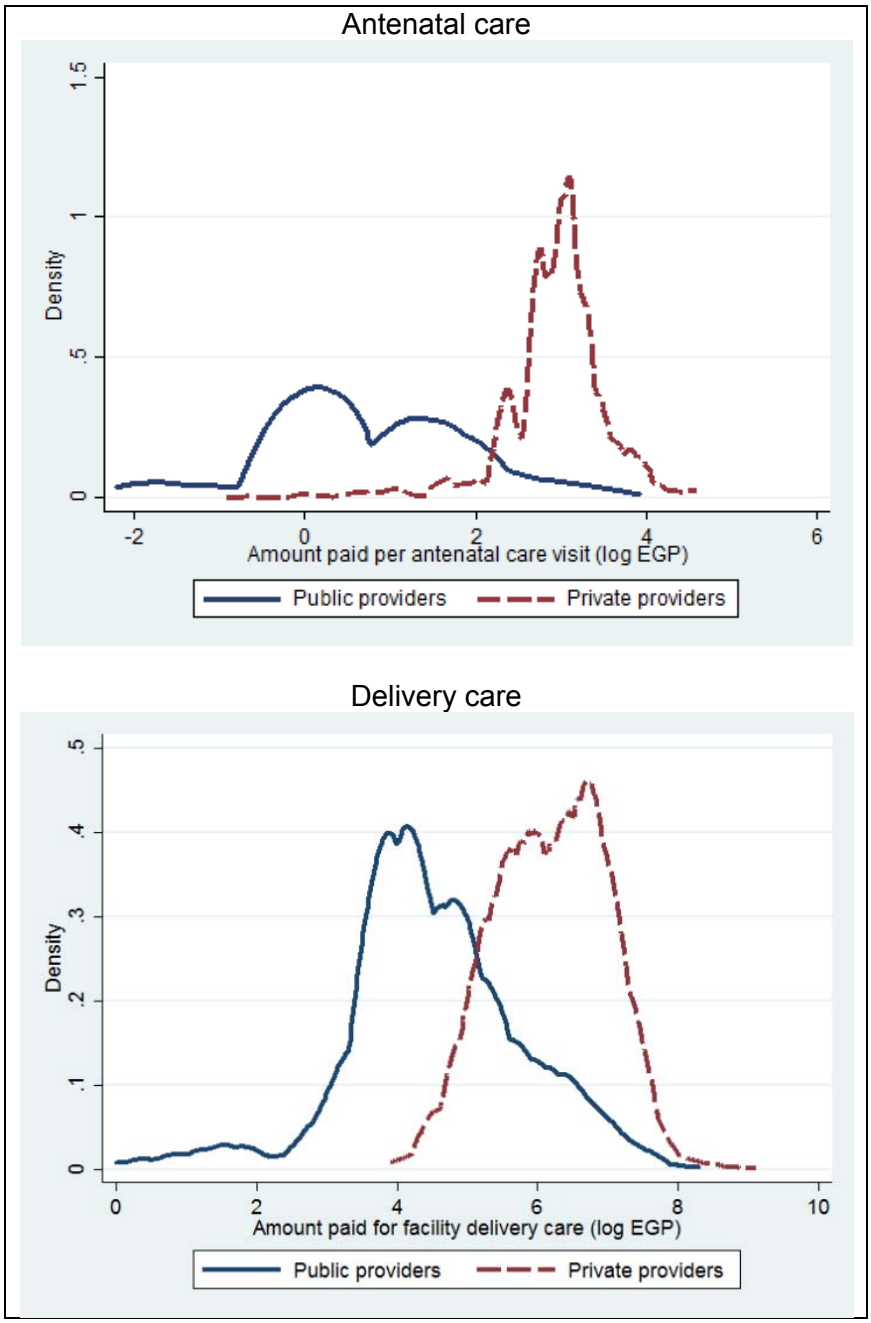
Women were asked whether they paid for ANC services (excluding expenditures on laboratory tests and medications) separately during each visit, on a one-time basis, or received ANC for free (Question 512). I created a binary variable reflecting whether the ANC service was free of charge or paid for. Among paying ANC users, I created a variable capturing the per-visit price of ANC. Women who reported receiving free care

in private facilities and outliers reporting paying >100 EGP per ANC visit (8 observations) were recoded as missing. To arrive at the per-visit price among women who incurred one-time payments, the total ANC expenditure was divided by the number of ANC visits during pregnancy. For women who reported paying for each ANC visit separately, I used the amount reported paid for the last ANC visit during pregnancy. The price of delivery service (excluding laboratory and medication expenses – Question 546), reported by women with a facility-based birth was analysed. I constructed a binary variable capturing whether public delivery care was received for free or not. Among women who reported paying for delivery service, a continuous variable captured the amount paid. The resulting continuous variables reflecting price paid for ANC and delivery care in Egyptian pounds (EGP, 1 USD = 5.5 EGP in 2008) paid for services were log-transformed to normalize their distribution (Figure 5.2) and means were estimated separately by provider type. Price of home-based ANC or delivery care was not examined.

Complete maternal care package

For the purposes of analysing receipt of the basic elements of maternal care, I defined a complete maternal care package as seeking of timely (first visit in the first trimester of pregnancy) and regular (four or more ANC visits during pregnancy) facility-based ANC and facility delivery. Women who did not receive all of these three care elements were considered not to have received the complete package. This binary classification was made regardless of whether such care was obtained from public or private providers and irrespective of the price paid for care.

Figure 5.2 Distribution of log-transformed price for maternal care, by sector



5.3.4 Confounders

I identified *a priori* confounders of the association between socio-cultural capital, economic capital and maternal health-seeking behaviours,[57] including woman's age group at the time of the most recent birth (in five-year groups),[197,251] parity at the time of the most recent pregnancy, and whether the pregnancy under analysis was intended or not (i.e., the pregnancy was unwanted or mistimed).[252] Elements of availability of health services were captured in the residence variable (urban or rural)

and whether respondent had unmet need for contraception at the time of the survey.[253] I created a binary variable for female head of household to capture the extent of the respondent's autonomous decision-making. This categorisation was based on the schedule of the household members. A woman was characterised as a female head of household if she was herself the head of household or she was the wife of the head of household. Variables related to health-seeking behaviours preceding the outcomes under investigation were also used in the analysis. These include the character of ANC received (none, some, regular), whether the woman reported receiving information on potential delivery complications during ANC (no [no ANC received, ANC received but did not receive information or did not remember receiving information], yes [received information on delivery complications during ANC]).

5.3.5 Statistical Analysis

Descriptive and multivariable statistical analyses were conducted based on the approach described in Chapter 4. In addition, I assessed the effectiveness of the targeting of free public care by comparing the mean socio-cultural and economic capital scores between women who received ANC or delivery care free of charge at public facilities with those who used these public services but paid for care. The extent of socio-economic inequalities accumulated throughout the health-seeking process for the most recent birth was estimated by comparing the mean socio-economic position scores of women who received the complete maternal care package with those who received no maternal care. Inequalities in this multidimensional outcome and in samples used for assessment of targeting were examined in the subsample of women who delivered in the twelve month period preceding the survey, using the t-test.

5.4 Results

5.4.1 Descriptive analysis

Table 5.1 displays the demographic and socio-economic characteristics of the samples analysed in this Chapter. The differences between the overall sample of women with a birth in five years preceding the survey (sample A) and the subsample of women who delivered in the 12-month period before the survey (sample B) included a younger age distribution, lower parity, lower proportion of unintended pregnancies, higher proportion of deliveries by caesarean section, lower proportion of women with female head of household status and higher mean socio-cultural capital score. Among ANC users,

women with price-of-care data did not differ from the women with missing price-of-care data in the distribution of demographic, pregnancy-related or socio-economic position factors. The proportion of missing price of care data did not differ between users of private and public providers in ANC or delivery samples (X^2 test p-values were 0.786 and 0.258, respectively).

Levels of the maternal health-seeking behaviours are described in Table 5.2 and shown in Figure 5.3. Among women with a birth in the five years preceding the survey, 74.2% received ANC for their most recent birth. Among ANC users, 82.5% started receiving ANC in the first trimester of pregnancy, 90.6% received regular ANC, and 76.6% visited a private provider. In terms of delivery care, 72.4% of women reported having delivered in a health facility, 63.0% of them in a private facility. Figure 5.4 shows that when combinations of ANC and delivery care are assessed, only 48.4% (95%CI 46.7%-50.0%) of women with a birth in five years preceding the survey obtained the complete maternal care package.

The eleven different combinations of ANC and delivery care behaviour are shown in detail in Figure 5.5 and simplified with consideration to presence of a SBA at delivery in Figure 5.6. The comparison between the two figures shows that very few women who delivered at home received assistance from a skilled birth attendant. The proportion of women receiving the complete maternal package increased only incrementally from 48.4% when only facility deliveries were considered to 49.7% when home deliveries with SBA were also included. Half of the women in the sample did not receive the complete care package, 13% of women received some ANC but delivered at home without SBA and 24% of women delivered in facilities without any previous ANC. Figure 5.6 shows that among women without a complete care package, one quarter received no maternal care at all, one quarter received some or complete ANC but delivered outside a health facility without SBA, one quarter delivered in a facility but received no ANC, and one quarter received incomplete ANC and delivered in a health facility.

Figure 5.7 shows the sample of all women according to whether they received ANC or facility delivery care and if so, whether the provider was from the public or the private sector. For both types of care, the private sector was the dominant provider. In fact, a larger proportion of women did not receive ANC and delivery care than the proportion which received care from the public sector. Focusing on women who sought care, Figure 5.8 examines the detailed provider types while retaining the public/private

dichotomy. Private doctors provided the vast majority of private ANC services (93%). Government health units were the dominant provider of public ANC (65%), and accounted for 15.2% of ANC users overall. Crude analysis of the number of ANC visits showed that women obtaining private ANC received a significantly (t-test p<0.001) higher average number of visits during pregnancy (9.2, 95%CI 9.0-9.4) compared to users of public ANC (7.6, 95%CI: 7.3-7.9). The provider mix was more varied among women who reported delivering in a health facility. Private doctors were the dominant private provider of delivery care, private hospitals/clinics served 15.5% of users overall. Government hospitals provided 21.8% of facility delivery care, followed by other government facilities (12.2%). NGOs and other private providers were approached by <3% of women who sought facility-based ANC or delivery care.

In the subsample of women with births in 12 months preceding the survey, 38.1% of women who sought public ANC reported receiving free care. On the other hand, 24.1% of women who delivered in a public facility reported receiving care free of charge. The geometric mean of price per ANC visit was 2.0 EGP among paying users of public providers and 18.4 EGP in private providers (Table 5.2). The mean price of paid public delivery care was 97 EGP, differing between normal (64 EGP) and caesarean section (203 EGP) deliveries. The mean price of private facility delivery was 490 EGP, and this price ranged from an average of 300 EGP for a normal delivery to 889 EGP for a caesarean section.

5.4.2 Multivariable logistic regression analysis for antenatal care

The results of multivariable analysis of the association between socio-economic position and dimensions of ANC health-seeking are presented in Table 5.3. Both measures of socio-economic position were strongly associated with seeking any ANC. A one unit increase in socio-cultural capital was associated with 1.55 (95%CI 1.40-1.72) higher odds and one unit increase in economic capital was associated with 2.18 (95%CI 1.92-2.48) higher odds of seeking any ANC. Other than the youngest age group (which showed lower odds of seeking any ANC compared to the reference group aged 20-24), age group was not associated with seeking ANC. However, higher parity was strongly associated with seeking ANC - women pregnant with their second child had half the odds and women with parity four or higher only one third the odds of seeking ANC than primigravidae. Lastly, women residing in rural areas had 33% lower odds of seeking ANC than those living in urban areas.

Among women who sought any ANC, higher socio-cultural capital scores were marginally associated with higher odds of receiving ANC in the first trimester. On the other hand, economic capital was significantly and positively associated with timely initiation of ANC – a one unit increase in economic capital score resulted in more than doubling in the odds of receiving timely ANC. Women with high parities and with unintended pregnancies had lower odds of seeking ANC in the first trimester of pregnancy. Both socio-cultural capital and economic capital were positively associated with regular ANC use. Again, women with high parities, unintended pregnancies and residing in rural areas had lower odds of receiving four or more visits during pregnancy. Both socio-economic position variables were also positively and significantly associated with the fourth dimension of ANC health-seeking behaviour, the use of private sector providers. As in the previous dimensions, women with higher parity were less likely to seek care with private providers. However, women with an unintended pregnancy, unmet need for contraception and residing in rural areas had higher odds of seeking ANC with a private provider.

5.4.3 Multivariable logistic regression analysis for delivery care

The multivariable models of the use of health facilities for delivery care are shown in Table 5.4. A one unit increase in socio-cultural capital was associated with 31% higher odds of delivering in a health facility, whereas a one unit increase in economic capital more than doubled the odds of this outcome. Women in higher age groups and those who had received ANC care for the pregnancy had significantly higher odds of delivering in a facility. On the other hand, women of higher parities and living in rural areas had significantly lower odds of facility delivery. Among women who delivered in health facilities, both socio-economic position variables were significantly positively associated with a choice of private provider. Women with unintended pregnancies and living in rural areas had higher odds of choosing private delivery care. Women who received ANC were more likely, but those who were informed of potential delivery complications were less likely to deliver in private facilities

Table 5.5 shows results of multivariable analyses examining the associations between socio-economic position and receipt of ANC/delivery care free of charge among women who received public care in the 12 months preceding the survey. Among women who received public ANC, a one unit increase in socio-cultural capital led to 2.08 higher odds of free ANC care ($p<0.001$). On the other hand, a one unit increase in economic capital halved the odds of free ANC care (OR 0.56, $p=0.038$). From the remaining

covariates, only region of residence was significantly associated with receipt of free public ANC; rural residence more than doubled the odds. Among women delivering in public facilities, socio-cultural capital was positively associated with receipt of free care (OR=1.30), but this association was not significant (p=0.180). A one unit increase in economic capital was associated with 31% lower odds of receiving free public delivery care, but this association was also not significant (p=0.117). Women residing in rural areas had higher odds of free public delivery care (OR=1.43), but this variable as well as none of the other covariates were significantly associated with this outcome.

5.4.4 Mediation analysis for antenatal and delivery care

Table 5.6 summarises the estimates from adjusted mediation analysis for the eight binary health-seeking outcomes. The first two columns provide the adjusted odds ratios and 95% confidence intervals showing the direct effect of socio-cultural capital and economic capital on the outcomes. The total effect of socio-cultural capital, expressed as the sum of the changes in the probability of outcome, combines the direct and indirect (mediated by economic capital) effects of socio-cultural capital. When the confidence interval of this estimate crosses the zero value, the total effect of socio-cultural capital is not significant; a positive estimate shows that an increase in socio-cultural score results in an increase in the adjusted proportion of women with the outcome. For the objectives of this Chapter, the most salient effect estimate is shown in the fourth column. It estimates the proportion of the total effect of socio-cultural capital that is mediated through economic capital.

For all outcomes with the exception of receiving free public delivery care, the total effect of socio-cultural capital was positive and significant. The strongest absolute increases in the probability of outcome (≥8%) were seen for any ANC use, private ANC use, facility delivery, private delivery use, and free public ANC care. These were also the five outcomes in which the indirect (mediated) effect contributed up to a half of the total effect of socio-cultural capital. This predominance of the direct effect was most clearly seen in the analysis of free public ANC, where the associations of socio-cultural acted in the opposite direction to the association of economic capital, and the total effect therefore consisted solely of the direct effect of socio-cultural capital. In the remaining two outcomes (timely ANC and regular ANC), the total effect of socio-cultural capital was positive and significant, but mainly mediated by economic capital.

5.4.5 Targeting of free public care

Figure 5.9 displays the mean levels of socio-economic capital and economic capital between various sub-samples of women with a birth in the 12 months prior to survey. Panels A and B show that the mean scores among women who received the complete maternal care package were significantly higher than the mean scores of all women in this sample and higher than among women who did not receive any facility-based maternal services. Panel C contrasts the mean scores of three sub-samples of women according to ANC health-seeking behaviour outcomes. The mean socio-cultural and economic capital scores among women who received free public ANC were marginally lower than among all users of public ANC (t-test p-values 0.052 and 0.029, respectively). However, non-users of ANC had significantly lower mean socio-cultural ($p<0.001$) and economic ($p=0.005$) capital scores compared to women who received free public ANC. Panel D shows that the data were consistent with no difference in the mean socio-cultural capital ($p=0.983$) and economic capital ($p=0.221$) scores between women who received free public delivery care and all women who received public delivery care. However, the mean socio-cultural capital and economic capital scores were significantly lower among women who did not deliver in a facility compared to those who received free public care (p-values 0.002 and <0.001, respectively).

5.5 Discussion

This is the first study to examine multiple dimensions of maternal health-seeking in adjusted analysis on a nationally-representative sample from Egypt. Its findings showed that although nearly half of women who delivered between 2003 and 2008 received the complete maternal care package for their most recent birth, 40% of women received incomplete care and more than 1 in 10 women did not receive any ANC or facility delivery care. The multivariable mediation analysis showed that both socio-cultural capital and economic capital were significantly positively associated with receiving ANC and delivering in a health facility. Socio-cultural capital was the main driver of women's preference for private providers, but economic resources largely determined the timeliness and frequency of care.

In order to capture the most recent patterns of health-seeking behaviour, I analysed the circumstances surrounding the most recent birth in the recall period. The overall response rate to the EDHS 2008 survey was high. However, this analysis faced several limitations. Firstly, the cross-sectional and observational design of this study limited the

ability to assess causal relationships between socio-economic position and health-seeking behaviours. All measures of health-seeking behaviour analysed in this study were self-reported. I expect the report of the occurrence of a live birth in the recall period to be reliable, yet the health-seeking behaviour variables (e.g., number of ANC visits, type of delivery facility) may be affected by measurement error, in particular recall bias and social desirability bias.[63,254] A study in rural China showed that validity of women's recall of ANC timing and components up to five years since the delivery showed high sensitivity (~90%) but low specificity.[63] Women's self-report of the level of health facility utilised in delivery care had high sensitivity and specificity in Mozambique.[255] The information about ANC was collected only about the most recent birth and although information about delivery circumstances of all births in the five-year recall period were available, I chose to only assess both ANC and delivery health-seeking behaviours for the most recent pregnancy and delivery to minimise such error. However, the validity of women's recall of the various dimensions of maternal health-seeking has not been assessed in Egypt, and may be differentially biased according to the time that had elapsed since the events took place.[200,256]

I encountered two issues with the DHS response options for facility type. The DHS survey provided a total of six types of public facilities, yet one-eighth of women who delivered in a facility reported giving birth in "other government" facilities. It would be important to understand which specific public facility type(s) these were and consider whether such types should be specifically mentioned as response options in future DHS rounds. Secondly, the response 'private doctor' does not provide a valid response to the question *where* ANC and delivery care was sought. Such care from a private doctor may have been provided in a private clinic or in a public hospital; locations that are distinct and should have been captured by the other available response options. I limited the analysis of price of maternal care to births occurring in the twelve months prior to survey.

The extent of missing data for price of ANC was minimal. However, more than 10% of women who delivered in facilities had a missing value for the price of delivery care. This may suggest that while women themselves pay for their ANC, they are not present at the time when the delivery care charge is paid and may not be aware of the amount paid. However, it is likely that even if women did not know or remember the exact amount paid, they might be able to correctly report whether delivery care was obtained for free or not. Women who reported obtaining free care from private providers (very few) were recoded as missing. While the large majority of private care was provided by

commercial providers, it is possible that women obtaining care from NGOs correctly reported receiving free care. I was unable to use the data collected on the expenditures for laboratory tests and medications during ANC and delivery care due to high levels of missingness. No data about the potentially substantial indirect costs of care (e.g., loss of income, expenditure for transportation) were collected.[257] While this is the first study to examine women's expenditures on maternal care in Egypt, the interpretation of the findings should be cautious in light of these limitations.

The main contribution of this analysis stems from including both socio-cultural and economic aspects of socio-economic position in the mediation model predicting their association with various dimensions of maternal health-seeking behaviour. This approach allowed for the estimation of the total effect of socio-cultural capital as well as the decomposition into its direct and indirect components. However, for this estimated model to be valid, there should be no unmeasured confounding in any part of Figure 4.6.[258] While I attempted to identify and include all a priori confounders, the presence of unmeasured confounding cannot be completely ruled out.[259] I believe that women's obstetric risk profile may be one such confounder, but the information (e.g., complications in previous deliveries, a complete history of assisted deliveries) that would allow the construction of this profile was not captured on the DHS. Instead, women's age group and parity were used as proxies. I conducted sensitivity analysis adjusting for multiple births (twins and triplets) in the most recent pregnancy and found that the estimates of association between socio-cultural capital and economic capital remained unchanged (results not shown).

5.6 Conclusion

This Chapter showed the existence of large socio-economic inequalities in the coverage of basic maternal health care. It also provided insights into the mechanisms through which socio-economic position is associated with the various health-seeking behaviours. The average price paid for an ANC visit was nearly ten times higher in private facilities compared to public facilities and the average price paid for delivery care was five times higher in private compared to public facilities. A woman receiving regular ANC (four visits) and a caesarean section delivery would be expected to pay between 211 EGP (all care from public facilities) and EGP 963 (all care from private facilities) for these services; excluding laboratory charges, medications and other costs such as transportation, child-care and foregone income. In light of the 41.2% poverty rate in Egypt in 2008-2009,[260] it is not surprising that only half of the women received

the complete maternal care package, and that this multidimensional health-seeking outcome was strongly socio-economically patterned.

Several findings of this Chapter allude to the importance of quality of care to women's health-seeking behaviours. The direct effect of socio-cultural capital was the primary pathway associated with women's choice of private providers. Women who sought private ANC received a higher number of ANC visits than women using public providers of ANC. While outside of the scope of this Chapter, it would be important to assess whether quality of maternal care differed by sector of provider to assess if these associations seen are results of better quality of care provided to women with different preferences and abilities to pay for care, or are driven by potential financial incentives for over-medicalisation of care, such as unnecessary diagnostic tests and caesarean section deliveries. Women living in rural areas were more likely to seek maternal care from private providers than women in urban areas. Future research should examine whether this regional variation is due to general unavailability of public providers in rural areas or related to other characteristics of private providers which differentiate them from public providers (more convenient opening hours, social desirability of private care, and higher objective/perceived quality of care). Lastly, a better understanding of the complexities of public-private practice by Egyptian health professionals needs to be developed to assess the quality of care women perceive and receive, and how these factors enable or discourage women's access to maternal care.[261] Women with unintended (unwanted or mistimed) pregnancies were less likely to seek ANC and delivery care, a result similar to analysis conducted on the 1995 DHS.[252] This Chapter showed that among users of ANC and delivery care, women with unintended pregnancies were more likely to use private providers.

Further improvements in maternal health in Egypt depend on increasing coverage of maternal interventions among the poorest and most disadvantaged segments of society.[262] Women with higher SEP, residing in urban areas and pregnant with their first child showed a high coverage of basic maternal care. However, higher parity, rural residence, and low socio-economic position had detrimental effects on the probability of obtaining the basic maternal care package. The effect of parity on health-seeking behaviours is important due to the consistently high fertility rates in Egypt. The sub-optimal targeting of free public care also needs to be addressed. This Chapter showed that women who received free public ANC or delivery care did not have significantly lower economic capital scores than all women using public care. In fact, the most socio-economically vulnerable women did not seek any maternal care at all. While

supply-side interventions to assure availability of high-quality public care should focus on rural areas, there is also a role for better retention of women in preventive care throughout their reproductive lifespan in order to raise the proportions of pregnancies and births that received the basic components of maternal care.

Table 5.1 Distribution of demographic, socio-economic and pregnancy-related variables in analysis samples

Characteristics	Sample of women	All women with a live birth in recall period		ANC users			Facility delivery users		
				All		ANC price available	All		Delivery price available
	Recall period	*5 years*	*1 year*	*5 years*	*1 year*	*1 year*	*5 years*	*1 year*	*1 year*
	Sample name	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
	Sample size	*7,896*	*2,581*	*5,861*	*2,058*	*1,994*	*5,715*	*1,962*	*1,724*
Age group	14-19 (%)	9.2	10.9	9.4	10.8	10.8	9.3	11.0	11.0
	20-24	32.5	35.6	33.5	36.2	36.4	31.8	35.6	35.6
	25-29	30.6	29.8	31.1	30.4	30.2	31.2	30.0	29.9
	30-34	16.6	14.7	15.7	14.0	14.0	16.4	14.3	14.1
	35-39	8.7	7.5	8.2	7.3	7.2	8.9	7.7	7.9
	40-49	2.4	1.5	2.1	1.3	1.4	2.4	1.4	1.5
Parity	0 (%)	27.3	35.0	31.4	38.4	38.4	31.5	39.5	39.0
	1	27.9	26.2	28.6	25.8	25.6	28.7	26.0	26.9
	2	21.4	19.8	20.8	19.2	19.4	20.9	19.1	18.9
	3	11.9	10.6	10.5	9.8	9.6	10.3	9.3	9.1
	4 or more	11.5	8.4	8.7	6.8	7.0	8.6	6.1	6.1
Household status	Female head (%)	78.0	73.6	79.3	74.5	74.5	79.7	74.7	73.8
	Not female head	22.0	26.4	20.7	25.5	25.5	20.3	25.3	26.2
Desire for pregnancy	Unintended (%)	15.3	14.0	13.7	12.1	12.3	13.7	12.3	12.8
	Intended	84.7	86.0	86.3	87.9	87.7	86.3	87.7	87.2
	Missing	<0.1	<0.1	<0.1	0.0	<0.1	<0.1	0.0	<0.1
Need for contraception	Unmet (%)	12.2	12.7	11.3	11.8	11.8	11.4	12.7	12.8
	Met	87.8	87.3	88.7	88.2	88.2	88.6	87.3	87.2
Region	Urban (%)	38.2	37.4	43.8	41.8	41.1	45.3	43.0	43.3
	Rural	61.8	62.6	56.2	58.2	58.9	54.7	57.0	56.7
C-section delivery	Yes (%)	29.2	31.5	34.3	35.5	35.3	40.3	41.5	42.6
	No	70.8	68.5	65.7	64.5	64.7	59.7	58.5	57.4
Socio-cultural capital	Mean	0.027	0.061	0.137	0.134	0.126	0.138	0.146	0.148
	SE	0.0118	0.0158	0.0123	0.0166	0.0165	0.0128	0.0172	0.0179
Economic capital	Mean	0.064	0.063	0.177	0.148	0.139	0.198	0.175	0.173
	SE	0.0133	0.0169	0.0139	0.0178	0.0172	0.0144	0.0184	0.0195

SE: standard error. Complex survey design (weighting, clustering and stratification) was accounted for in calculations of proportions and sample sizes reported.

Table 5.2 Maternal health-seeking behaviours for most recent birth

Health-seeking behaviour dimension	Variable type	Samples and missing data				Distribution of outcome in analysed sample and 95% CI
		Eligible sample and recall period	Eligible sample (size)	Missing data (%)	Analysed sample (size)	
Antenatal care (ANC)						
1. Used ANC	Binary	All women with birth 5 years prior to survey	7,896	-	7,896	74.2% (72.8 - 75.6)
2. ANC in 1st trimester of pregnancy	Binary	All women with birth 5 years prior to survey who used any ANC	5,861	0.2	5,851	82.5% (81.3 - 83.7)
3. Regular use of ANC (4+ visits)	Binary	All women with birth 5 years prior to survey who used any ANC	5,861	0.9	5,798	90.6% (89.7 - 91.4)
4. ANC from private provider	Binary	All women with birth 5 years prior to survey who used any ANC	5,861	-	5,861	76.6% (74.9 - 78.1)
5. Public provider: ANC free of charge	Binary	All women with birth 1 year prior to survey who used public ANC	426	1.6	419	38.1% (32.7-43.7)
6. Public provider: Price of ANC (EGP)	Continuous	All women with birth 1 year prior to survey who used public ANC and paid for care	259	-	259	GM 2.0 (1.7 – 2.3)
7. Private provider: Price of ANC (EGP)	Continuous	All women with birth 1 year prior to survey who used private ANC	1,633	3.6	1,575	GM 18.4 (17.8 – 19.1)
Delivery care						
8. Delivered in a health facility	Binary	All women with birth 5 years prior to survey	7,896	<0.1	7,893	72.4% (70.8 - 73.9)
9. Used private delivery facility	Binary	All women with birth 5 years prior to survey who delivered in a health facility	5,715	-	5,715	63.0% (61.1 - 64.9)
10. Public provider: Delivery free of charge	Binary	All women with birth 1 year prior to survey who delivered in a public health facility	700	12.7	611	24.1% (20.3 – 28.3)
11. Public provider: Price of delivery (EGP)	Continuous	All women with birth 1 year prior to survey who delivered in a public health facility and paid for delivery	464	-	464	GM 96.6 (83.5 – 111.7)
12. Private provider: Price of delivery (EGP)	Continuous	All women with birth 1 year prior to survey who delivered in a private health facility	1,262	11.8	1,113	GM 489.8 (462.5 – 518.7)

Complex survey design was accounted for in calculations of proportions, means and confidence intervals. EGP: Egyptian pound 95%CI: 95% confidence interval
GM: Geometric mean. ANC: Antenatal care.

Table 5.3 Multivariable logistic regression for ANC health-seeking behaviour

Health-seeking dimension		Any ANC use		ANC in first trimester		Regular ANC use		Private ANC use	
Sample size		*7,890*		*5,848*		*5,795*		*5,858*	
		OR (95% CI)	*p*	*OR (95% CI)*	*p*	*OR (95% CI)*	*p*	*OR (95% CI)*	*p*
Socio-cultural capital[1]		1.55 (1.40-1.72)	<0.001	1.13 (0.98-1.30)	0.096	1.20 (1.01-1.42)	0.037	1.79 (1.57-2.04)	<0.001
Economic capital[1]		2.18 (1.92-2.48)	<0.001	2.08 (1.75-2.46)	<0.001	2.31 (1.85-2.89)	<0.001	1.91 (1.61-2.26)	<0.001
Age group	14-19	0.78 (0.62-0.98)	0.035	1.08 (0.81-1.45)	0.604	0.75 (0.52-1.08)	0.161	0.79 (0.61-1.03)	0.076
	20-24	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	25-29	1.07 (0.91-1.25)	0.442	0.99 (0.81-1.21)	0.907	0.98 (0.76-1.26)	0.759	0.90 (0.75-1.08)	0.267
	30-34	1.01 (0.83-1.25)	0.891	0.91 (0.70-1.17)	0.454	0.91 (0.65-1.29)	0.607	1.10 (0.86-1.41)	0.431
	35-39	1.12 (0.87-1.44)	0.388	1.51 (1.06-2.15)	0.022	1.06 (0.70-1.62)	0.770	1.18 (0.85-1.63)	0.334
	40-49	1.22 (0.83-1.80)	0.312	1.01 (0.56-1.83)	0.969	0.99 (0.51-1.91)	0.973	1.01 (0.61-1.67)	0.996
Parity	0	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	1	0.47 (0.40-0.58)	<0.001	0.89 (0.72-1.10)	0.264	0.56 (0.42-0.76)	<0.001	0.69 (0.57-0.83)	<0.001
	2	0.39 (0.32-0.49)	<0.001	0.73 (0.56-0.94)	0.014	0.45 (0.32-0.63)	<0.001	0.75 (0.59-0.94)	0.013
	3	0.35 (0.27-0.45)	<0.001	0.78 (0.57-1.06)	0.115	0.75 (0.49-1.15)	0.185	0.63 (0.47-0.83)	0.001
	4 or more	0.31 (0.23-0.41)	<0.001	0.58 (0.40-0.84)	0.005	0.43 (0.27-0.68)	<0.001	0.77 (0.55-1.08)	0.136
Female head of household	Yes	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	No	0.89 (0.78-1.03)	0.108	0.95 (0.79-1.15)	0.608	0.88 (0.70-1.10)	0.254	0.89 (0.76-1.06)	0.198
Desire for pregnancy	Intended	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	Unintended	0.91 (0.78-1.07)	0.250	0.71 (0.57-0.87)	0.001	0.71 (0.54-0.93)	0.012	1.23 (0.99-1.53)	0.062
Need for contraception	Met	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	Unmet	0.93 (0.79-1.10)	0.404	1.01 (0.81-1.25)	0.964	0.87 (0.66-1.14)	0.314	1.36 (1.10-1.68)	0.005
Region	Urban	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	Rural	0.67 (0.58-0.77)	<0.001	1.11 (0.93-1.32)	0.261	0.61 (0.46-0.79)	<0.001	1.90 (1.62-2.24)	<0.001

[1] Odds ratio associated with one unit increase in capital score. OR: odds ratio. 95%CI: 95% confidence interval. P-value of Wald test. ANC: antenatal care.

Table 5.4 Multivariable logistic regression model for delivery care health-seeking behaviour

Health-seeking dimension		Facility delivery use		Private delivery facility	
Sample size		*7,887*		*5,712*	
		OR (95% CI)	*p*	*OR (95% CI)*	*p*
Socio-cultural capital[1]		1.31 (1.16-1.47)	<0.001	1.51 (1.34-1.70)	<0.001
Economic capital[1]		2.12 (1.84-2.45)	<0.001	1.80 (1.55-2.11)	<0.001
Age group	14-19	0.94 (0.75-1.18)	0.602	1.14 (0.91-1.46)	0.274
	20-24	1 (ref)		1 (ref)	
	25-29	1.50 (1.26-1.79)	<0.001	1.07 (0.90-1.27)	0.452
	30-34	2.05 (1.64-2.56)	<0.001	0.99 (0.80-1.25)	0.942
	35-39	2.90 (2.19-3.85)	<0.001	0.84 (0.62-1.12)	0.230
	40-49	3.40 (2.19-5.26)	<0.001	0.94 (0.59-1.48)	0.774
Parity	0	1 (ref)		1 (ref)	
	1	0.55 (0.45-0.66)	<0.001	0.94 (0.79-1.12)	0.488
	2	0.40 (0.32-0.50)	<0.001	1.10 (0.88-1.37)	0.394
	3	0.28 (0.21-0.36)	<0.001	1.02 (0.77-1.34)	0.900
	4 or more	0.23 (0.17-0.31)	<0.001	1.25 (0.90-1.73)	0.179
Female head of household	Yes	1 (ref)		1 (ref)	
	No	0.94 (0.81-1.10)	0.447	1.06 (0.90-1.27)	0.494
Desire for pregnancy	Intended	1 (ref)		1 (ref)	
	Unintended	0.92 (0.77-1.10)	0.383	1.06 (0.89-1.29)	0.487
Need for contraception	Met	1 (ref)		1 (ref)	
	Unmet	1.04 (0.87-1.24)	0.689	1.25 (1.03-1.53)	0.024
Region	Urban	1 (ref)		1 (ref)	
	Rural	0.65 (0.54-0.79)	<0.001	1.96 (1.61-2.38)	<0.001
ANC use	None	1 (ref)		1 (ref)	
	Some	1.50 (1.21-1.87)	<0.001	1.67 (1.26-2.21)	<0.001
	Regular	2.67 (2.30-3.11)	<0.001	1.98 (1.66-2.37)	<0.001
Received information on delivery complications	No	1 (ref)		1 (ref)	
	Yes	1.41 (1.20-1.66)	<0.001	0.79 (0.68-0.92)	0.002

[1] Odds ratio associated with one unit increase in capital score. OR: odds ratio. 95%CI: 95% confidence interval. P-value of Wald test.

Table 5.5 Multivariable logistic regression model for receiving free maternal care among users of public care with a birth in 12 months preceding the survey

Health-seeking dimension		Free public ANC		Free public delivery care	
	Sample size	*417*		*609*	
		OR (95% CI)	*p*	*OR (95% CI)*	*p*
Socio-cultural capital[1]		2.08 (1.39-3.10)	<0.001	1.30 (0.88-1.90)	0.180
Economic capital[1]		0.56 (0.32-0.97)	0.038	0.69 (0.43-1.10)	0.117
Age group	14-19	0.67 (0.31-1.46)	0.312	0.68 (0.32-1.46)	0.326
	20-24	1 (ref)	-	1 (ref)	-
	25-29	0.96 (0.53-1.74)	0.899	0.97 (0.54-1.73)	0.911
	30-34	2.25 (1.17-4.54)	0.023	1.13 (0.54-2.36)	0.737
	35-39	2.25 (0.75-6.69)	0.146	1.10 (0.46-2.64)	0.836
	40-49	1.73 (0.26-11.65)	0.569	0.69 (0.12-3.75)	0.666
Parity	0	1 (ref)	-	1 (ref)	-
	1	1.01 (0.53-1.94)	0.971	0.76 (0.45-1.29)	0.306
	2	0.87 (0.43-1.78)	0.711	0.80 (0.39-1.66)	0.554
	3	0.53 (0.24-1.16)	0.111	0.77 (0.32-1.89)	0.570
	4 or more	0.59 (0.19-1.79)	0.352	0.95 (0.32-2.81)	0.926
Female head of household	Yes	1 (ref)	-	1 (ref)	-
	No	1.20 (0.72-2.00)	0.479	0.88 (0.51-1.52)	0.644
Desire for pregnancy	Intended	1 (ref)	-	1 (ref)	-
	Unintended	0.70 (0.36-1.39)	0.308	1.06 (0.55-2.03)	0.861
Need for contraception	Met	1 (ref)	-	1 (ref)	-
	Unmet	0.68 (0.31-1.48)	0.323	0.96 (0.50-1.85)	0.901
Region	Urban	1 (ref)	-	1 (ref)	-
	Rural	2.65 (1.52-4.60)	0.001	1.43 (0.86-2.36)	0.166
ANC use	None			1 (ref)	
	Some			0.53 (0.20-1.44)	0.215
	Regular			1.08 (0.61-1.92)	0.787
Received information on delivery complications	No			1 (ref)	-
	Yes			0.98 (0.60-1.57)	0.916

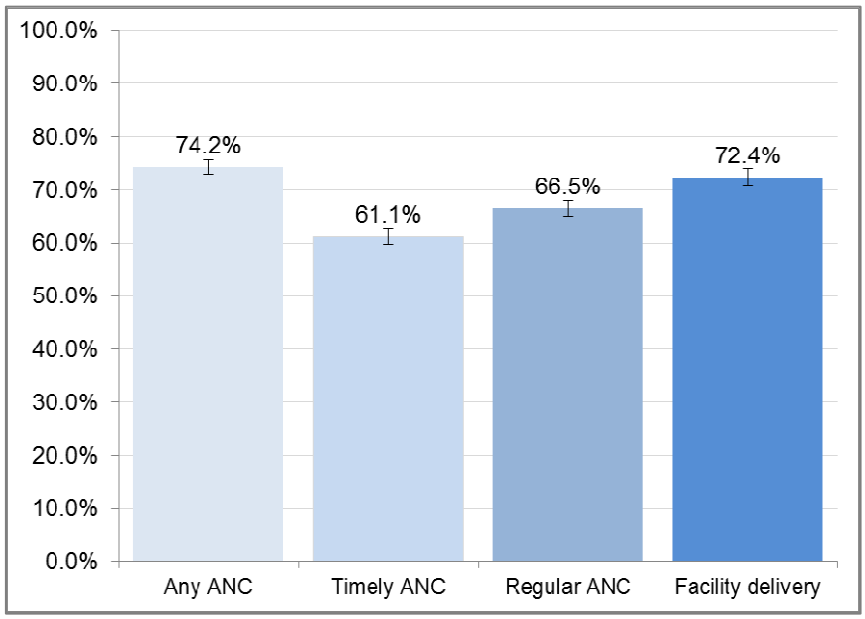
[1] Odds ratio associated with one unit increase in capital score. OR: odds ratio. 95%CI: 95% confidence interval. P-value of Wald test.
ANC: antenatal care.

Table 5.6 Mediation: Adjusted effects of socio-cultural capital and economic capital on binary maternal health-seeking behaviours

Utilisation of maternal services	(1) Direct effect of socio-cultural capital	(2) Direct effect of economic capital	(3) Total effect of socio-cultural capital	(4) % of total effect of socio-cultural capital mediated by economic capital
	OR (95% CI)	*OR (95% CI)*	*ΣΔp (95% CI)*	*% (95% CI)*
Any ANC use[1]	1.55 (1.40 to 1.72)	2.18 (1.92 to 2.48)	0.10 (0.09 to 0.11)	42% (38% to 48%)
ANC in first trimester[1]	1.13 (0.98 to 1.30)	2.08 (1.75 to 2.46)	0.05 (0.04 to 0.07)	73% (57% to 100%)
Regular use of ANC[1]	1.20 (1.01 to 1.42)	2.31 (1.85 to 2.89)	0.03 (0.02 to 0.04)	66% (53% to 90%)
Private ANC use[1]	1.79 (1.57 to 2.04)	1.91 (1.61 to 2.26)	0.12 (0.10 to 0.13)	31% (27% to 35%)
Facility delivery use[2]	1.31 (1.16 to 1.47)	2.12 (1.84 to 2.45)	0.08 (0.06 to 0.09)	52% (44% to 65%)
Private delivery facility[2]	1.51 (1.34 to 1.70)	1.80 (1.55 to 2.11)	0.13 (0.11 to 0.15)	35% (30% to 42%)
Free public ANC[1*]	2.08 (1.39 to 3.10)	0.56 (0.32 to 0.97)	0.12 (0.04 to 0.21)	0%
Free public delivery care[2*]	1.30 (0.88 to 1.90)	0.69 (0.43 to 1.10)	0.03 (-0.04 to 0.10)	Not applicable

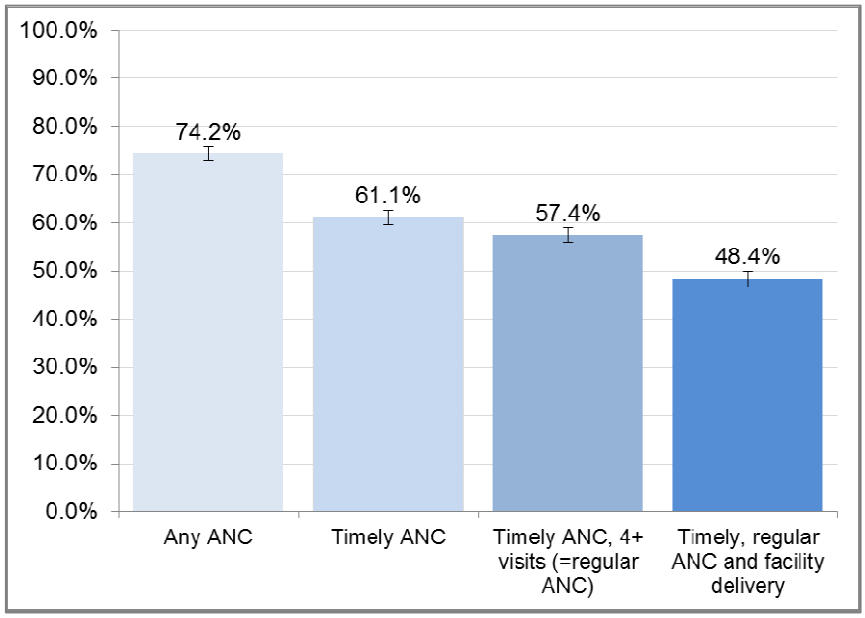
OR: Odds ratio associated with one unit increase in capital score. 95%CI: 95% confidence interval. ANC: antenatal care.
ΣΔp: Total effect of socio-cultural capital expressed as sum of the changes in probability of outcome based on both indirect (mediated by economic capital) and direct effects.
*Free public care was assessed in subsample of women with a birth in the 12 month period preceding the survey.
[1] Adjusted for age group, parity, household status, pregnancy intended, unmet need and region.
[2] Adjusted for age group, parity, household status, pregnancy intended, unmet need, region, type of ANC use, and information on delivery complications.

Figure 5.3 Levels of maternal health-seeking for most recent birth



Timely ANC: received first ANC visit in first trimester of pregnancy.
Regular ANC: Received 4 or more ANC visits during pregnancy.

Figure 5.4 Accumulation of health-seeking dimensions leading to complete maternal care package for most recent birth



Timely ANC: received first ANC visit in first trimester of pregnancy.
Regular ANC: Received 4 or more ANC visits during pregnancy.

Figure 5.5 Detailed combinations of health-seeking behaviours among women

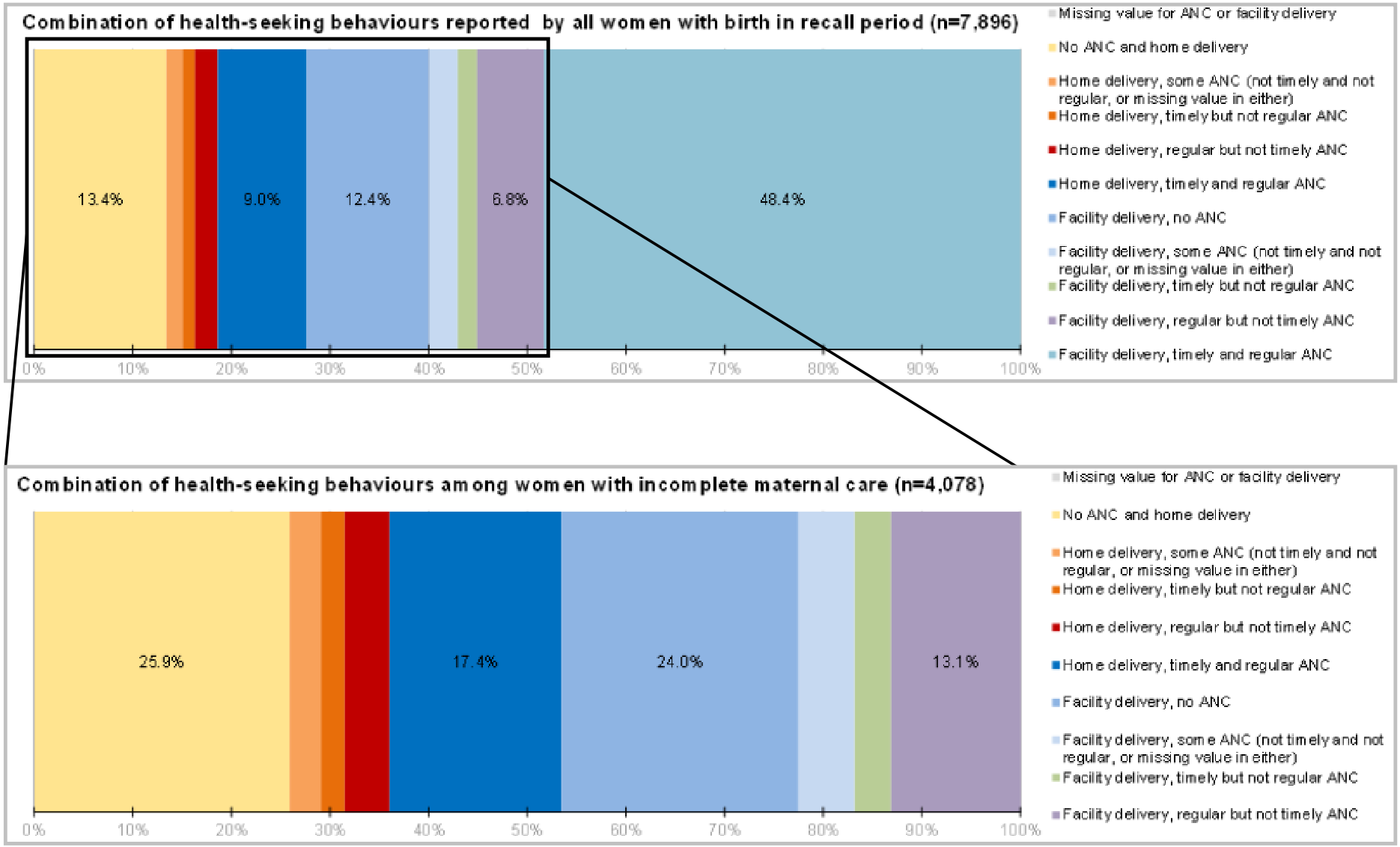


Figure 5.6 Categories of combinations including assistance by skilled birth attendant (SBA) among women with complete ANC

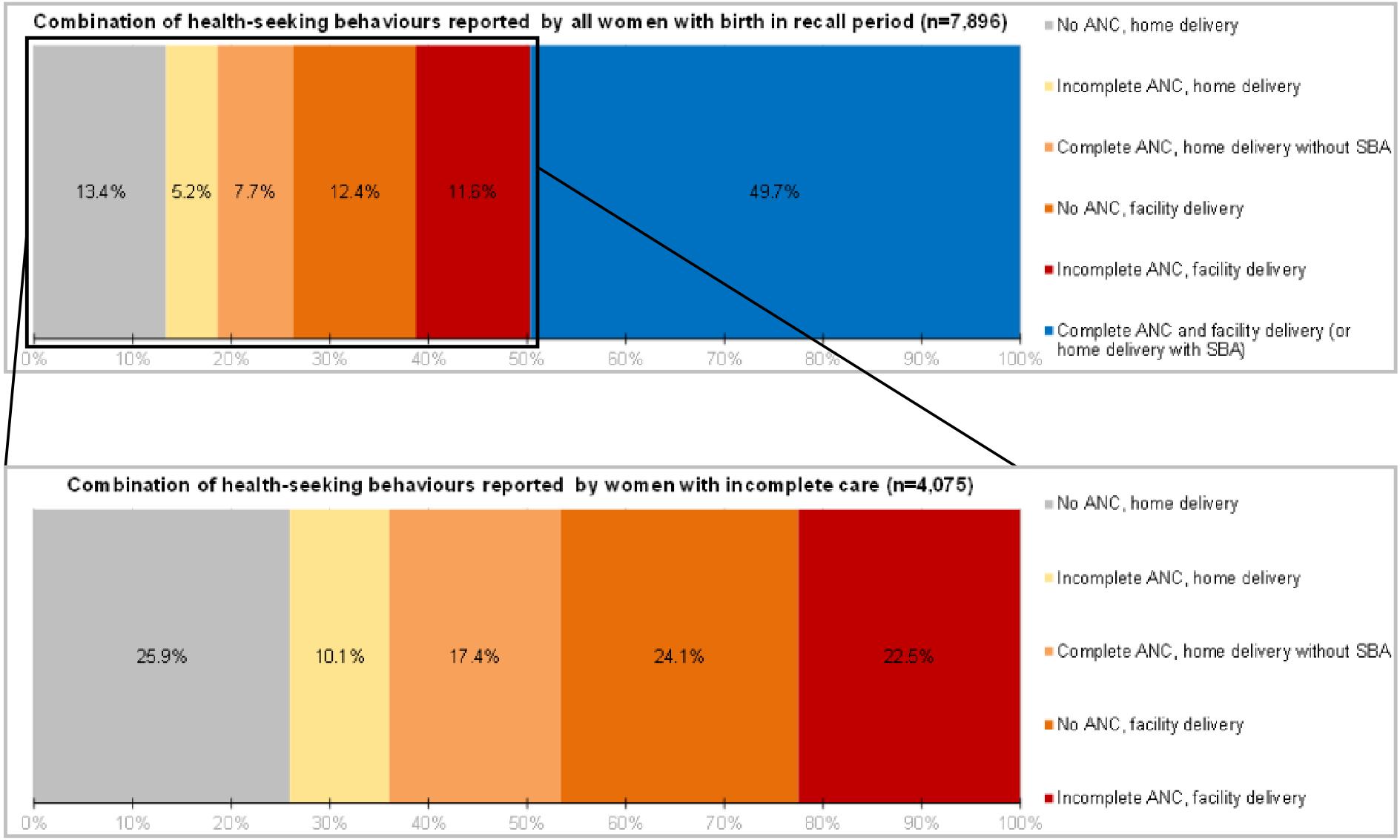


Figure 5.7 Sector of provider approached among users of facility-based antenatal and delivery care

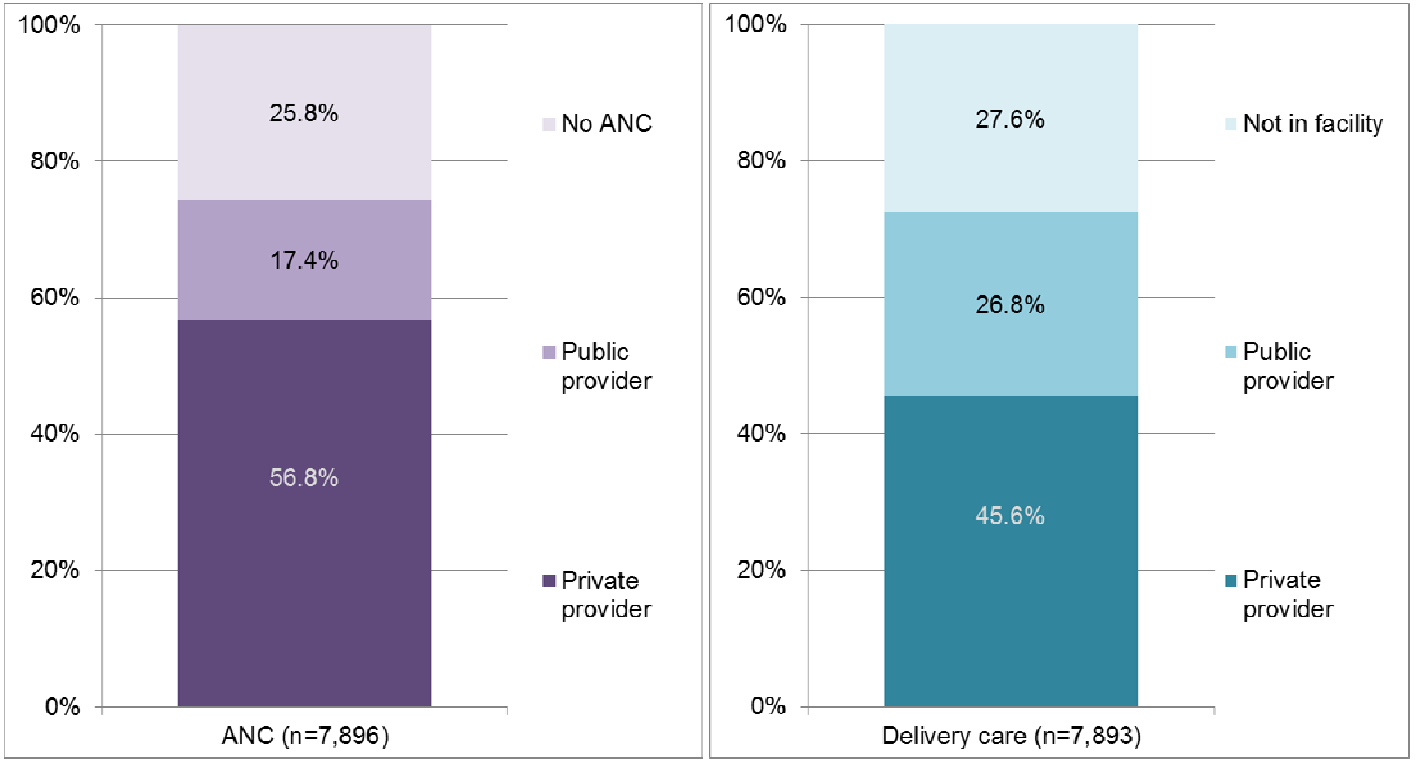


Figure 5.8 Detailed type of provider approached among users of facility-based antenatal and delivery care

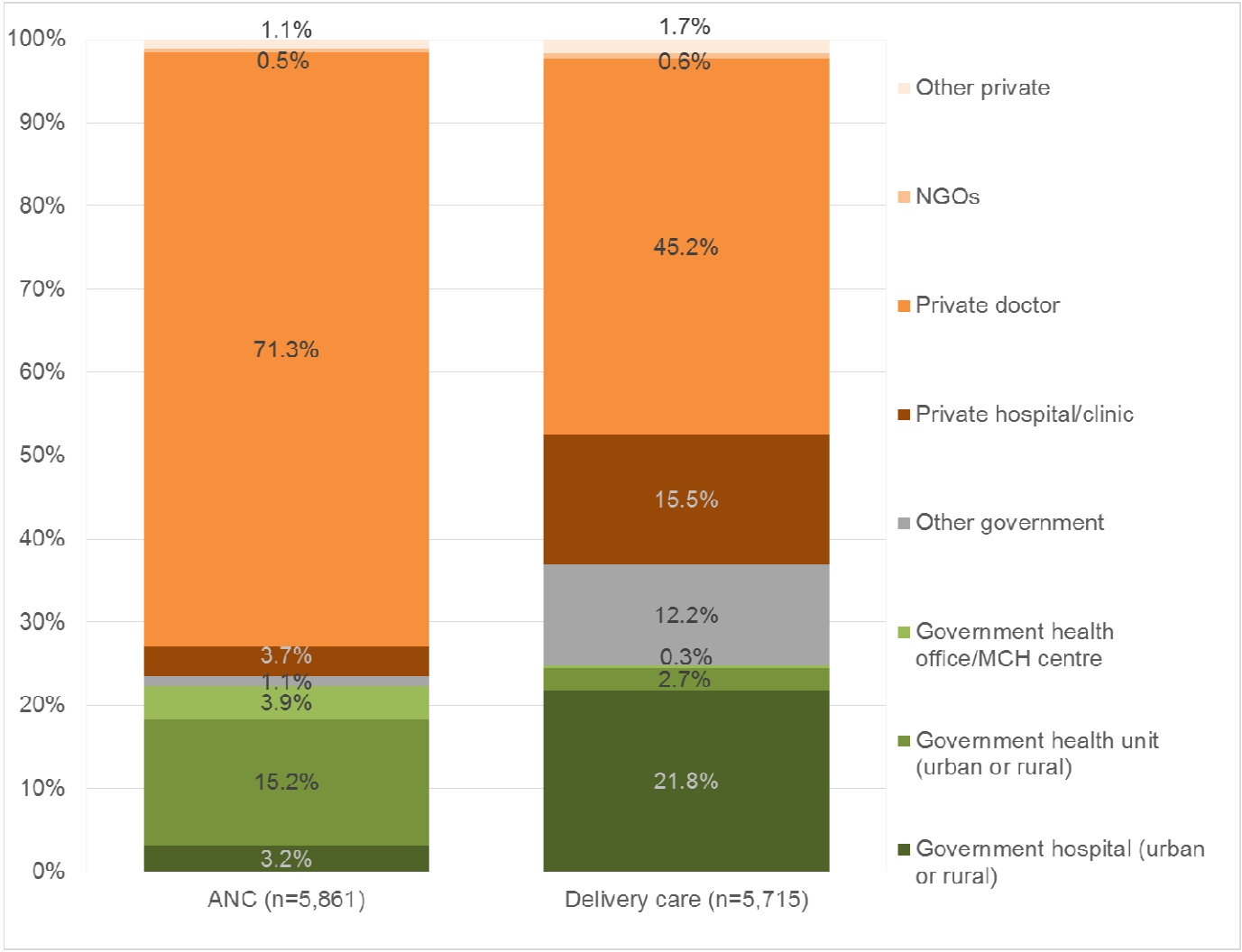
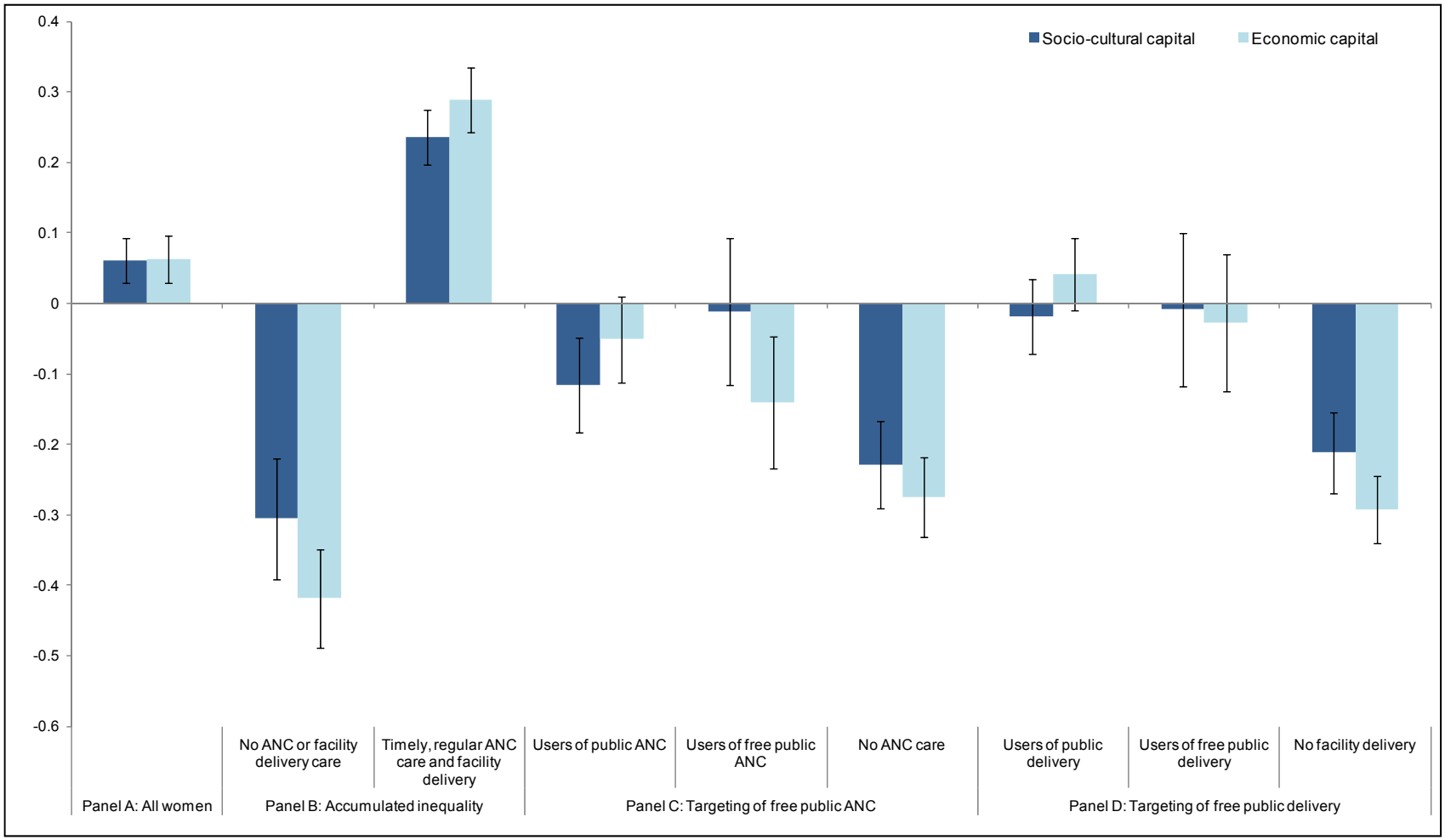


Figure 5.9 Socio-cultural and economic capital mean scores (95% confidence intervals) within subsamples of women who gave birth in the twelve month period preceding survey



Timely ANC: received first ANC visit in first trimester of pregnancy. Regular ANC: Received 4 or more ANC visits during pregnancy. ANC: Antenatal care.

6 DHS: Child health-seeking behaviours

This Chapter will be submitted to the Maternal and Child Health Journal.

6.1 Abstract

Background

The existence and magnitude of socio-economic inequalities in health-seeking behaviours for child curative care in Egypt and mechanisms underlying these associations have not been comprehensively examined. This Chapter examined whether socio-economic position (SEP) was associated with health-seeking behaviours for diarrhoea and acute respiratory infection (ARI) in children and explored the mechanisms underlying these associations using mediation analysis.

Methods

A sample of children <5 years of age living with their mothers from the 2008 Demographic and Health Survey was used. The prevalence of diarrhoea and ARI in the preceding two-week period was estimated. If either illness was reported, three dimensions of health-seeking were examined in adjusted mediation models, separately by illness: whether medical care was sought, whether such care was timely (within one day of symptom onset) and whether it was received from private providers. Parental socio-cultural capital and household-level economic capital were the main exposures.

Results

In the sample of 10,006 children, 8.4% had diarrhoea and 7.6% had ARI during the recall period. 62.0% of children with diarrhoea and 78.5% with ARI sought care. Two-thirds of care-seeking occurred on a timely basis. More than 7 in 10 children who received care were taken to private providers. For both illnesses, neither socio-cultural capital nor economic capital were independently associated with reporting illness or receiving care. However, for both illnesses, in adjusted analyses socio-cultural capital was positively associated with timely care-seeking, and economic capital was positively associated with private provider use.

Conclusions

Socio-economic position was not a strong determinant of reporting diarrhoea or ARI in children <5 years, or of seeking care for these illnesses. There was a modest positive total effect of socio-cultural capital on timely receipt of care and on private provider use. Further research is needed to explore perceptions of illness severity as well as availability and quality of care provided by both the public and private sectors.

6.2 Introduction

Coverage and equity of child health interventions have gained prominence in light of Millennium Development Goal 4 aim to reduce the <5 mortality rate by two-thirds between 1990 and 2015. Egypt achieved large decreases in infant and child mortality; infant mortality (the probability of dying during the first year of life per 1,000 live births) decreased from 62 to 25 per 1,000 live births between 1990 and 2006.[115] During the same period, <5 mortality (the probability of dying before the fifth birthday) declined from 85 to 28 per 1,000 live births.[115] Despite decreasing at an average annualized rate of -5.4% between 2000 and 2013, an estimated 41,300 deaths <5 years occurred in Egypt in 2013,[109] and substantial geographic and socio-economic differentials in mortality remain. The 2008 EDHS estimated that in the 10 years preceding the survey, <5 mortality was 19 per 1,000 live births in the wealthiest quintile of households and 49 per 1,000 in the poorest quintile. The geographic comparison of under–five mortality showed that urban Lower Egypt had the lowest (18/1,000) and rural Upper Egypt the highest rate (46/1,000).

Mortality attributed to diarrhoea and pneumonia was estimated to account for 18% of deaths among children under the age of five years in Egypt in 2010.[263] However, a study employing verbal autopsy methods showed that diarrhoeal diseases and acute respiratory infection were the leading causes of mortality among children 1-4 years of age, accounting for more than 80% of these deaths.[264] A better understanding of the determinants of health-seeking behaviours for curative care after the onset of these illnesses is therefore crucial to developing strategies that contribute to further reductions in <5 mortality.

Socio-economic resources are well-established determinants of child care utilisation in low- and middle-income countries. In Egypt, large gaps exist in the understanding of the extent of socio-economic inequalities in curative health-seeking behaviours for children. The systematic review of literature presented in Chapter 3 did not identify any published papers assessing health-seeking behaviours related to child illnesses using the 2008 Egypt DHS, or any studies that used adjusted analytical methods to examine the association between socio-economic position and health-seeking behaviour for curative care in children on a nationally-representative sample in Egypt.[247] The only analysis of nationally-representative data of curative health-seeking for child illnesses used data from the 1995 and 2000 DHS rounds to estimate crude socio-economic inequalities based on the DHS wealth index.[183] This report by Gwatkin and

colleagues found that the extent of socio-economic inequalities in seeking care decreased between the two surveys for acute respiratory infection (ARI), but increased for diarrhoea. Furthermore, they found that the inequality in choosing a private provider increased for both illnesses.

6.2.1 Objectives

This Chapter aimed to extend the limited understanding of the association between socio-economic position and child health-seeking behaviours in Egypt. First, it described the prevalence of diarrhoea and ARI reported for children <5 years of age living in Egypt. Secondly, it characterised the process of health-seeking for children with these illnesses using three dimensions: whether medical care was sought, whether such care was timely (within one day of illness onset), and whether it was received from private providers. Thirdly, it examined the association of socio-economic position with progression through these dimensions of health-seeking. This objective was accomplished through using latent variables capturing two constructs of socio-economic position in mediation analysis.

6.3 Methods

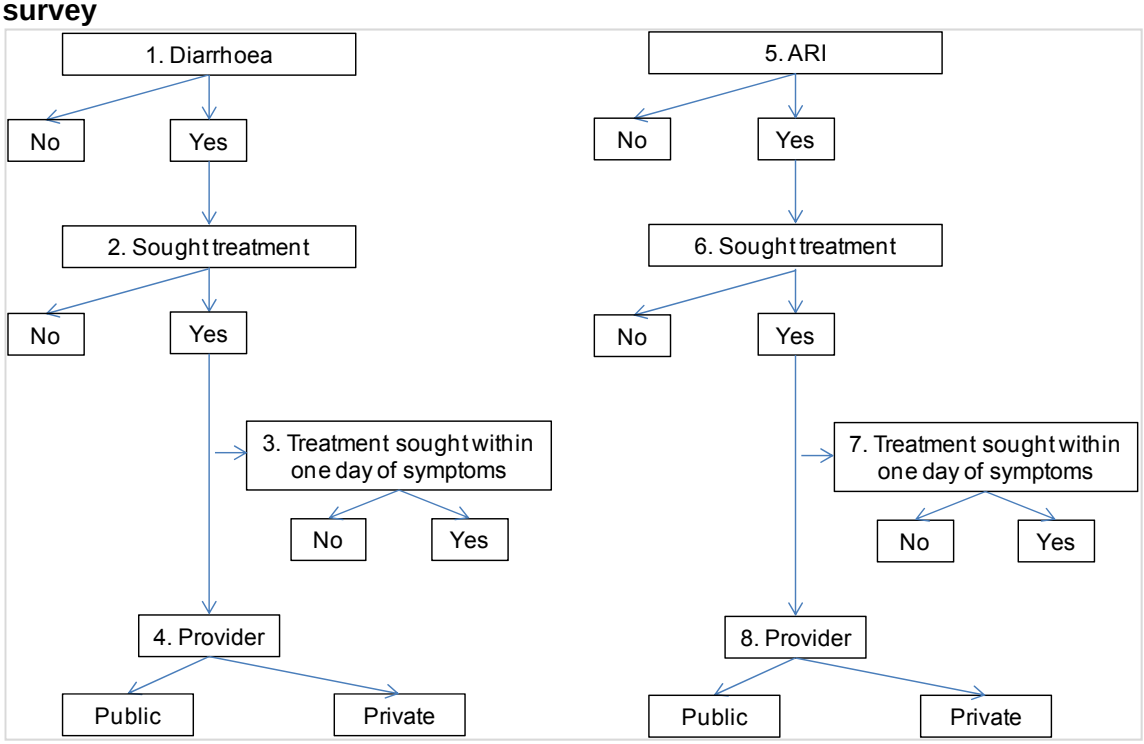
6.3.1 Study sample

The analysis was based on a nationally-representative survey of ever-married women aged 15-49 from the 2008 DHS. To examine health-seeking behaviours related to child illness, a sample of children <5 years of age was identified from the children recode dataset. Children were included in the analysis if their mother was alive and resided in the sampled household, and if the child lived with the mother. Multiple children per household and per mother were allowed. Children were assigned the socio-cultural capital score of their parents and the economic capital score of their households.

6.3.2 Exposures

The latent variables of socio-economic capital and economic capital were considered as continuous independent (exposure) variables. Additionally, economic capital was considered a mediator of the association between socio-cultural capital and the health-seeking behaviour outcomes.

Figure 6.1 Dimensions of curative health-seeking behaviours for illnesses reported for children under age of 5 years in the two-week period preceding the survey



ARI – Acute respiratory infection. Numbers correspond to health-seeking behaviour outcomes listed in Table 6.2.

6.3.3 Outcomes

The first step in assessing health-seeking behaviours for curative care was an analysis of the reporting of diarrhoea and ARI among children <5 years (0-59 old at the time of the survey). As shown in Appendix E, for each child in the sample, the mother was asked whether the child had diarrhoea in the two-week period preceding the survey. If the answer was affirmative, the questionnaire elicited whether there was blood in the child's stool and whether advice was sought from any source. If the mother confirmed that help was sought, the enumerator asked how many days elapsed between the onset of illness and the seeking of care, and the mother was also asked to list all the places that were approached. When the sequence of questions about diarrhoea was completed, the mother was asked whether, in the same two-week period, the child had fever and separately, whether the child had an illness with cough. If cough was reported, the mother was asked whether the child experienced rapid breathing or difficulty breathing, and if so, whether this fast or difficult breathing was chest- or nose-related, or both. If either fever or cough was reported, the sequence of three questions related to care-seeking was asked.

To analyse health-seeking behaviours, I considered children for whom diarrhoea or ARI were reported. ARI, a proxy for pneumonia, was defined as cough accompanied by short or rapid breathing which was chest-related. The severity of diarrhoea was assessed by the mother's report of blood in the stool, a proxy for dysentery. For both diarrhoea and ARI, the report of fever during the two-week recall period was considered as an additional symptom, although from the design of the questionnaire it is not possible to ascertain whether, in cases where more than one of the three symptoms were reported, such symptoms occurred at the same time. Among all children in the sample, I created binary variables capturing whether diarrhoea and ARI were reported or not. Separately for each reported illness, the health-seeking was characterised by whether or not help was sought. If help was sought, timely treatment was defined as seeking help within one day of onset of illness and whether the sector of provider was public or private (Figure 6.1).

Provider type

The response options listed for providers of care were the same for both illnesses. The respondents were asked to recall all places where care was sought (Appendix E, questions 633 and 651). To describe the specific types of provider approached for each illness, the responses were grouped into the following categories: government hospital (urban or rural), government health unit (urban or rural), other public (MCH center/health office/other government), providers from both sectors, private hospital/clinic, private doctor, private pharmacy, and other/NGO providers. If multiple providers were listed, the sector (public or private) was noted. If the multiple responses were within one sector, the highest clinical level of provider was selected. If providers from both sectors were listed, the category "providers from both sectors" was applied. In the binary provider outcome used in multivariable analysis of provider sector (public or private), the public sector was chosen if one or more public providers were approached. The private sector category was chosen if only private providers, or a combination of public and private providers were approached. This categorisation mirrors methods employed in analysing multiple providers for antenatal care in the previous chapter.

Private provider type 'pharmacy' was considered a valid response option for a provider of curative care in this analysis. Pharmacies provide substantial proportions of outpatient care in Egypt,[265,266] but pharmacists are not trained clinicians. The content and quality of care provided by pharmacies may differ from those provided in the other private sector providers. If price of treatment is a consideration, the socio-economic situation of women and households that use of pharmacies might be

expected to be lower than those who use private hospitals and doctors. In order to understand the association between socio-economic position and choice of private providers, I considered all private providers in the main models (including pharmacies), but also conducted sensitivity analyses excluding children taken only to pharmacies from the binary private treatment outcome. If other public and other/NGO private providers are considered to be clinical providers of care, this sensitivity analysis showed the association between the two latent socio-economic position variables and the odds of being taken to a private provider in a subset of children who were taken to clinical providers. The exclusion of pharmacies from consideration of appropriate sources of clinical care for ill children was the same as that used in the tabulations presented in the 2008 EDHS report. Expenditures for treatment of child illnesses were not collected on the survey.

6.3.4 Confounders

A priori confounders of the association between socio-cultural capital, economic capital and child health-seeking behaviours were identified from the existing literature.[115,167] These included child sex and age group (in one-year intervals), mother's age group (five-year intervals), preceding birth interval, the mother being a female head of household status (capturing the extent of the mother's autonomous decision-making, as described in the previous chapter). A variable capturing the number of children <5 years residing in the household derived from the household members roster (not necessarily children of the same mother) was included because a previous study from Egypt showed that the presence of another household member with diarrhoea was the strongest independent risk factor for diarrhoea,[267] and the number of young children may influence the ability of the main caretaker to leave the house for health-seeking. The presence of more children may also delay initial recognition of illness, because attention of adults is directed toward several small children. Elements of availability of health services were captured in the residence variable (urban or rural).

The child's breastfeeding status (currently, never and previously breastfed) was considered to be an *a priori* confounder in analyses of reporting of illness. The variable describing children's current breastfeeding status contained some missing data. It is likely that children for whom breastfeeding status was missing were different from those who have valid responses. I wanted to retain the maximum number of observations in the analysis sample and therefore created an additional response

option ‘missing’. A categorical variable capturing the month in which the interview was conducted (March, April or May/June) was considered a confounder in analysis of illness reporting due to the seasonal nature of childhood illness incidence.[178,268] This variable was also included in analyses of seeking care from private provider due to the possible influence of seasonality on perception of illness severity.[269] In analyses of health-seeking for diarrhoea, the presence of blood in stool was included as a proxy for illness severity. Binary variables capturing whether the child suffered from ARI or fever during the two-week recall period were also included.[270] Likewise, in analyses of health-seeking for ARI, binary variables capturing whether the child had fever or diarrhoea during the recall period were included in multivariable analyses. Lastly, the multivariable logistic regression models for the outcome capturing whether treatment was sought at a private provider, timely seeking of treatment (within a day of illness onset) was included as a covariate.

6.3.5 Statistical Analysis

Descriptive, multivariable and mediation analyses were conducted separately for the four binary outcomes available for each illness, based on the methodology described section 4.3. If a child was reported to have suffered from both diarrhoea and ARI during the recall period, he/she is included in both samples. The prefix *svy:* was used for all descriptive and multivariable models, and contained survey sampling clusters, strata and mother’s sampling weights. In the main analysis, sample PSUs were set as clusters. However, since more than one child per household was allowed in the analysis sample, I conducted sensitivity analyses with households considered as units on which illness reporting and health-seeking behaviour were clustered. The results of this sensitivity analysis were reported if significance levels of the odds ratio p-values for the two socio-economic position latent variables differed (either decreased below 0.05 or increased above 0.05) from the results of the main analysis.

6.4 Results

The 10,006 children included in the sample lived in 7,495 unique households; there were between one and four children <5 years of age living in these households. Descriptive characteristics of the three groups of children in the sample (all children, children with diarrhoea and children with ARI) are shown in Table 6.1. Children with either illness, and particularly children with diarrhoea, showed a younger age distribution and were more likely to be currently breastfeeding than all children in the

sample. However, neither children with diarrhoea nor children with ARI differed significantly from all children in gender composition. The proportion of children with ARI without a preceding birth interval (i.e., only children) was smaller than among all children in the sample. Mothers of children with diarrhoea were significantly younger than mothers of all children in the sample. A similar proportion of mothers in all three samples (approximately four fifths) were the female heads of their respective households. Children with diarrhoea or ARI did not differ significantly from all children in the sample in regard to the number of children <5 years of age living in their households. Children with ARI were marginally more likely than all children to reside in urban areas. There was a strong crude association between the month of interview and likelihood of having diarrhoea and ARI; children with either illness were more likely to have been interviewed earlier in the year. The mean socio-cultural capital score in households of children with diarrhoea and ARI did not differ from mean scores of all children. While the mean economic capital scores did not differ between children with diarrhoea and the overall sample, households of children with ARI had marginally lower mean economic capital scores than households of all children.

6.4.1 Burden of illness

Among all children, 8.4% (95%CI: 7.8-9.1) were reported to have had diarrhoea and 7.6% (95%CI: 6.9-8.4) had ARI. Figure 6.2 shows that 19.5% of all children in the sample were reported to have experienced one or more of the three illnesses (fever, ARI, diarrhoea) in the two-week recall period. Among the 1,952 children with for whom one or more illness was reported, 28.7% had only fever and none of the other two illnesses. Among the sample of 1,390 children with diarrhoea or ARI, half (56.1%) had two or three illnesses. Among the 840 children for whom diarrhoea was reported, 42.9% also had fever during the recall period. On the other hand, 77.6% of the 761 children with ARI were reported to have had fever during the recall period.

6.4.2 Health-seeking for ill children

Table 6.2 shows the sample sizes of children analysed in the eight dimensions of health-seeking, including definition of denominators and the prevalence of missing data. The levels of health-seeking outcomes are visually presented in Figure 6.3. Among children who had diarrhoea, assistance was sought for 62.0% (95%CI: 58.3-65.6). In the group of children with diarrhoea for whom treatment was sought, 61.8% (95%CI: 56.6-66.8) received timely treatment and 71.9% (95%CI: 67.2-76.2) were

taken to a private sector provider. Among children with ARI, 78.5% (95%CI: 74.9-81.8) were taken for treatment. Among children with ARI for whom treatment was sought, 62.0% (95%CI: 57.0-66.7) received timely treatment and 72.6% (95%CI: 68.2-76.6) were taken to a private provider.

Detailed analysis of the provider sector and type approached for children with illness is shown in Figure 6.4. In both samples of children for whom care was sought, private doctor was the single most used source of treatment (53.4% of diarrhoea and 58.1% of ARI). Private doctors, government hospitals, government health units and private pharmacies together were approached in nine out of 10 cases when treatment was sought (87.2% for diarrhoea and 88.9% for ARI). A slightly higher percentage of children with diarrhoea for whom care was sought was taken to a private pharmacy (10.7%), compared to children with ARI (7.5%). For both illnesses, public sector care was mainly provided by hospitals and health units; other public providers were approached in 18% and 15% of cases when public sector was used for diarrhoea and ARI treatment, respectively. For both illnesses, the majority of private sector care was provided by private doctors; 74% of private care for diarrhoea and 80% of private care for ARI were sought there. Among children who were taken for treatment of diarrhoea, 4.3% approached more than one provider. More than one provider was sought for 2.9% of children who received care for ARI. Figure 6.4 shows that even smaller proportions of children for whom care was sought were taken to providers in both public and private sectors (2.5% for diarrhoea and 1.8% for ARI).

6.4.3 Multivariable logistic regression analysis for diarrhoea

Adjusted analysis showed that data were consistent with no association between socio-cultural capital or economic capital and the odds of reporting diarrhoea (Table 6.3). Female children had slightly lower odds of having had diarrhoea than male children (OR=0.91, 95%CI: 0.78-1.06), but this association was not significant. The odds of diarrhoea was highest among children 6-11 months old and decreased rapidly for older children, but was not associated with the length of the preceding birth interval. Compared to children of mothers in the reference group (20-24 years), those with mothers older than 34 years had lower odds of diarrhoea, and children of teenage mothers (14-19 year old) were more likely to have had diarrhoea (OR=1.37, 95%CI: 1.01-1.85). Mother's female head of household status was not associated with the adjusted odds of reporting diarrhoea. Children living in households with two or more children under the age of five years had marginally lower odds of reporting diarrhoea

than children in households where they were the only child <5 years. Children living in rural areas were less likely (OR=0.79, 95%CI: 0.63-0.98) to have had diarrhoea than children from urban areas. Compared to children who were previously breastfed and weaned, children breastfeeding at the time of the survey had 45% higher odds of diarrhoea (p=0.011). Compared to children whose households were interviewed in April, the odds of reporting diarrhoea in May/June were not different, but those interviewed in March had twice the odds of reporting diarrhoea (OR=2.02, 95%CI: 1.62-2.53).

Care was sought for two thirds of children with diarrhoea. In adjusted analysis, a one unit increase in economic capital score resulted in an increase of 33% (p=0.082) in the odds of seeking treatment. There was no association between socio-cultural capital and odds of seeking care for diarrhoea. Children older than 24 months had half the odds of being taken for care than children 6-11 months of age. There was no association between seeking care for diarrhoea and child gender, preceding birth interval, maternal age group, maternal household status and number of children <5 in the household. Children with diarrhoea living in rural areas had higher odds of being taken for care than those living in urban areas, but the association was not significant. Children with blood in the stool, fever and ARI in the recall period had significantly higher odds of being taken for treatment with diarrhoea than children without these additional symptoms.

Two-thirds of children who were taken for treatment with diarrhoea received this care within one day of illness onset. A one unit increase in socio-cultural capital was associated with 50% higher odds of receiving timely care (p=0.059). The p-value of this association was 0.046 when households were considered as units of clustering in sensitivity analysis. There was no association between economic capital and the odds of seeking timely diarrhoea care. Child age, gender, preceding birth interval and number of children <5 living in household showed no significant association with the odds of seeking timely care. Compared to children with mothers in the 20-24 age group, children of older mothers were less likely to be taken for timely diarrhoea treatment, although the association was only statistically significant for children of mothers in the oldest age group. Children whose mothers were not female heads of their households had lower odds of being taken for timely treatment (OR=0.53, 95%CI: 0.28-0.99). Children from rural areas had 74% higher odds of being taken for timely care compared to urban children. Children who had fever during the recall period had

higher odds of receiving timely diarrhoea care, although this association was not significant.

Among children for whom care for diarrhoea was sought, three quarters were taken to private sector providers. In adjusted analysis, socio-cultural capital was not associated with seeking private treatment. However, a one unit increase in economic capital was associated with a doubling in the odds of private treatment (OR=1.99, 95%CI: 1.26-3.13). There was some evidence that children in older age groups were less likely to be taken to private providers. Female children had 50% higher odds of being taken to a private provider compared to male children (p=0.061). Preceding birth interval, mother's age group, mother's female head of household status, number of children <5 in the household, region and month of interview were not significantly associated with the odds of approaching private providers. Blood in the stool, fever and ARI in the recall period were associated with lower odds of seeking private care, although not significantly. Children for whom care was sought within one day of illness onset had more than twice the odds of receiving private care compared to children for whom care-seeking was delayed (OR=2.08, 95%CI: 1.29-3.34).

The results of sensitivity analysis showing the adjusted model of private diarrhoea treatment among children who were taken to clinical providers is shown in Table 6.5. No change in the association between socio-cultural capital and seeking private care was seen. The odds associated with one unit increase in economic capital increased from 1.99 to 2.15. Further, the marginally higher odds of seeking private treatment for girls seen in the main model attenuated in the sensitivity analysis (OR=1.35, p=0.181). The magnitude and significance of the associations of the remaining independent variables and seeking private treatment among children with diarrhoea taken to clinical providers remained unchanged.

6.4.4 Multivariable logistic regression analysis for ARI

Adjusted analyses of the determinants of four dimensions of health-seeking for ARI are presented in Table 6.4. There was no association between economic capital and odds of reporting ARI. However, a one unit increase in socio-cultural capital was associated with a 15% decrease in the odds of reporting ARI (p=0.066). This association was significant (p=0.046) when households were considered as units of clustering. Female children appeared to have slightly lower odds of ARI than male children, but this association was not significant. The odds of ARI were highest among 6-11 month old

children, and decreased significantly for older children. Compared to children with a 24-46 month preceding birth interval, only children had lower odds of ARI (OR=0.72, 95%CI: 0.57-0.92). Mother's age group, female head of household status, and number of children <5 in the households were not associated with the odds of reporting ARI. Children living in rural areas were less likely (OR=0.74, p=0.020) to have had ARI than children living in urban areas. Compared to children who were weaned, children breastfeeding at the time of the survey had 33% lower odds of ARI (p=0.007). Compared to children whose households were interviewed in April, the odds of reporting ARI in May/June was 37% lower (p=0.003). However, children in households interviewed in March had 2.63 higher odds (95%CI: 2.10-3.30) of ARI than those interviewed in April.

Treatment was sought for 78.5% of children with ARI. In adjusted analysis, a one unit increase in socio-cultural capital score was associated with a 20% increase in the odds of seeking treatment, but this association was not significant (p=0.360). There was no association between economic capital and odds of seeking care for ARI. Child age was not significantly associated with seeking ARI treatment. Female children had 31% lower odds of being taken for treatment compared to male children (p=0.076). There was no association between odds of seeking ARI care and the length of the preceding birth interval, mother's age group, maternal household status and number of children <5 in the household. Children living in rural areas had higher odds of being taken for treatment than those living in urban areas (OR=0.81, 95%CI: 0.49-1.34), but this association was not significant. Children with fever in the recall period had more than triple the odds of being taken for treatment with ARI compared to children without fever (p<0.001). Children with diarrhoea in the recall period had lower odds of seeking treatment for ARI, but this association was not significant (OR=0.79, p=0.312).

Two-thirds of children who were taken for ARI treatment received care within one day of illness onset. Neither socio-cultural nor economic capital was significantly associated with the odds of seeking timely treatment for ARI. However, the direction of the association was positive for both variables. Child age, gender, preceding birth interval, maternal age group and number of children <5 living in household showed no significant association with the odds of seeking timely care. Children whose mothers were not female heads of their households had higher odds of being taken for timely treatment (OR=1.40) although this association was not significant (p=0.235). Children from rural areas had 56% higher odds of being taken for timely care compared to urban children (95%CI: 0.98-2.50). Children who had fever during the recall period were more

likely to receive timely ARI care than children without fever. Compared to children without diarrhoea during the recall period, children with diarrhoea had lower odds of receiving timely ARI treatment. However, neither of these two associations was significant.

Among children for whom ARI care was sought, three-quarters were taken to private-sector providers. In adjusted analysis, socio-cultural capital was not associated with seeking private treatment. However, a one unit increase in economic capital was associated with more than twice the odds of private treatment (OR=2.66, 95%CI: 1.57-4.52). Children in age groups older than 12 months were less likely to be taken to private providers than children 6-11 months, but the association was not significant. There was no association between child gender, preceding birth interval, mother's age group, mother's female head of household status, and number of children <5 in the household and the odds of seeking private treatment for ARI. Compared to children living in urban areas, children from rural areas had twice the odds of being taken for private ARI care (OR=1.96, 95%CI: 1.18-3.27). Compared to children whose households were interviewed in April, those interviewed in May/June had half the odds of being taken for private care (p=0.075). Fever and diarrhoea in the recall period were associated with lower odds of seeking private care, although not significantly. Receiving private care for ARI was not associated with treatment timeliness.

Sensitivity analysis among a sub-sample of children with ARI who were taken to clinical providers rather than pharmacies showed that the magnitude and significance of the associations between the two latent socio-economic position variables and private treatment were unchanged from the main model. As shown in Table 6.5, economic capital was significantly and positively associated with seeking private care. The negative association between diarrhoea during the recall period and odds of seeking private care for ARI became significant (OR=0.63, p=0.048). The associations of the remaining independent variables and seeking private treatment among children with ARI taken to clinical providers remained unchanged.

6.4.5 Mediation analysis for diarrhoea health-seeking outcomes

The results of mediation analysis with the adjusted models for health-seeking in response to diarrhoea are presented in Table 6.6. Neither socio-cultural capital nor economic capital was associated with seeking treatment for diarrhoea; the total effect of socio-cultural capital on this outcome was also not significant and mediation analysis

was not applicable. Among children for whom care was sought, a one unit increase in socio-cultural capital resulted in a 7 percentage point increase in the probability of seeking timely treatment. The total effect of socio-cultural capital was solely direct (0% was mediated by economic capital). Socio-cultural capital was not associated with the odds of seeking private care, but there was a strong association between economic capital and this outcome. The total effect of socio-cultural capital on the probability of seeking private care for positive; a one unit increase in socio-cultural capital resulted on average in a 5 percentage point increase in the probability of seeking private care among children for whom care was sought. Economic capital mediated the vast majority (92%) of this total effect of socio-cultural capital.

6.4.6 Mediation analysis for ARI health-seeking outcomes

Table 6.6 also shows that neither socio-cultural capital nor economic capital were associated with seeking treatment for ARI. The total effect of socio-cultural capital on this outcome was also not significant and mediation analysis was not applicable. Among children for whom ARI care was sought, the total effect of a one unit increase in socio-cultural capital was a 7 percentage point increase in the probability of seeking timely treatment (95%CI: 0%-13%). On average, 28% of this effect was mediated by economic capital. Socio-cultural capital was not associated with the odds of seeking private care, but there was a strong association between economic capital and this outcome. The total effect of socio-cultural capital on the probability of seeking private care was positive; a one unit increase in socio-cultural capital resulted, on average, in a 6 percentage point increase in the probability of seeking private care among children for whom ARI care was sought. Economic capital was the primary mechanism of this total effect.

6.5 Discussion

This is the first analysis to examine curative health-seeking for child illness in a nationally-representative sample from Egypt using multivariable analysis, and also the first in-depth analysis of these outcomes based on data from the 2008 DHS. The prevalence of diarrhoea among children <5 years in the two-week recall period (8%) was substantially lower than the 18% level reported in the 2005 Egypt DHS (both surveys were conducted in the Spring). The period prevalence of ARI remained at approximately the same level between the surveys: 9% (2005) and 8% (2008).[115,159]

More than half of the children who had either diarrhoea or ARI suffered from multiple illnesses or symptoms (diarrhoea, ARI and/or fever).

Reporting of diarrhoea or ARI was not independently associated with either measure of socio-economic position. Younger children, those living in urban areas (potentially related to informal and slum housing), and interviewed earlier in the year were more likely to have had diarrhoea and ARI. However, it is not possible to determine whether this is difference in period prevalence is a result of different incidence, illness duration, illness severity, or an artefact of reporting related to perception of illness. Current breastfeeding had a protective effect on ARI. However, in comparison to weaned children, those currently breastfeeding had higher odds of diarrhoea, which may be related to supplementary feeding practices such as weaning foods/liquids. Three-fifths of children with diarrhoea and four fifths of children with ARI accessed care. In case of both illnesses, neither of the two latent socio-economic position variables was strongly associated with the odds of seeking care and the total effect of socio-cultural capital was not significant. For both diarrhoea and ARI, two-thirds of children for whom care was sought received it within a day of the onset of illness. The private sector provided the majority of care for both illnesses. Mediation analysis showed that for both illnesses, socio-cultural capital had a significant positive total effect on seeking timely care and that this effect was largely, if not completely, the result of its direct effect. On the other hand, the significant positive total effect of socio-cultural capital on the choice of private provider for both illnesses was almost entirely mediated by economic capital. These associations held in sensitivity analyses when private pharmacies were excluded as appropriate treatment providers.

Limitations

The survey response rate was high and extent of missing data was minimal. However, this analysis had several limitations. First, the aim of this analysis necessitated the use of previously created latent constructs of socio-economic position. Socio-cultural capital is a measure of parental knowledge, awareness and collaboration, whereas economic capital captures the household-level availability of financial resources and expenditure preferences. These two latent variables were created for female respondents of reproductive age, and therefore were only available for children whose mothers were alive. The selection of children into the analysis sample excluded sampled children whose mothers were not residents of sampled households because the data to construct their primary household's economic capital score was not available. There are no reliable recent estimates of the proportion of children whose mother is not alive,

but it is highly likely that such children are more vulnerable to illness and may also have more limited access to health services. From the original sample of children <5 years, 7.6% was excluded due to non-residence in the sampled household. On average, excluded children had higher mean socio-cultural scores (0.080) than children who were retained in the analysis sample (-0.013, t-test $p<0.001$).

Second, this Chapter relied on secondary data which were not powered to test hypotheses about the factors associated with the various health-seeking dimensions. It is possible that some of the associations shown in the results, especially those with small sample sizes, would have been statistically significant if a sufficient sample size had been available. It is for this reason that the interpretation of findings includes a discussion of associations that were marginally significant ($0.05<p<0.1$).

The analysis of health-seeking in this Chapter started with a self-report of child illness. The perception and accurate recall of illness among young children has numerous issues of reliability and validity. Accurate reporting of symptoms depends largely on the respondent's knowledge of these symptoms, and on the subjective perception of illness by the respondent and/or other household members. The two-week recall period for recall of ARI as a proxy for pneumonia was found to have acceptable specificity for the purpose of monitoring trends in the proportion of children who receive medical care in Egypt.[177] Mothers, the respondents in the survey, have been shown able to recognise rapid or difficult breathing among their children.[271] Previous research has shown that the two-week period for recall of diarrhoea carried higher sensitivity than longer periods, which may lead to an underestimation of diarrhoea by 20%-40%, depending on severity of symptoms.[130,272] While shorter time periods may improve accuracy of illness reporting, a further reduction from the currently used two-week period may severely restrict the sample size of children available for analysis of health-seeking.[273]

Despite ill-health being concentrated among the poorest and most vulnerable groups in any society, a phenomenon of illness reporting and use of healthcare among richer groups is seen.[274] This phenomenon has been partly attributed to a lower level of sensitivity to illness among the groups most affected by it. It has been documented in Egypt,[275] and posited as one of the mechanisms underlying the socio-economic gradients in infant and child mortality.[150] The analysis of factors associated with health-seeking behaviours in this Chapter did not allow for a direct assessment of socio-economic patterns in illness perception which could underlie this important bias.

It is possible that the extent of illness was under-perceived and under-reported for children living in households with lower socio-economic position. The crude tabulations of diarrhoea and ARI period prevalence in the EDHS report showed that children living in poorer households were *more* likely to have been ill.[115] However, the multivariable analysis in this Chapter failed to identify a strong independent effect of either socio-economic position variable on illness reporting.

The first analysed dimension of health-seeking behaviour (seeking care) did not contain information about whether children who were taken for care actually received appropriate treatment. Conversely, children for whom no medical care was sought may have received appropriate treatment at home, for example a home-made oral rehydration solution for diarrhoea. Several questions on the survey attempted to capture which medications the child received. These were captured by some of the global monitoring indicators, but were not assessed here as they reflected on the content/quality of care rather than the health-seeking behaviours.

No recent studies have assessed the reliability and validity of reports of timeliness of care and provider type in Egypt. In order to reduce the potential outcome misclassification, I dichotomised this outcome, considering health-seeking within one day of illness onset as timely. However, seeking care beyond one day after illness onset did not necessarily mean that care-seeking was delayed. It could have reflected a situation when initial symptoms were mild and self-limiting, but which progressively became serious enough to seek treatment. A second issue with the assessment of the timely dimension of health-seeking is that in cases when the illness onset occurred on the day before the survey or on the day of survey, sufficient time had not yet elapsed for this outcome to occur. This limitation extends to the first dimension (seeking any care) in that this outcome may still occur in the future, and is therefore misclassified as not having sought care. While the questionnaire asked whether the child was still ill at the time of the survey, information about the duration of the illness episode at the time of survey was not collected. The availability of both pieces of information would allow for a more precise analysis of seeking any care and seeking timely care among the group of children who had the illness long enough to have sought care, and for a comparison of illness duration between children who were taken for treatment and those who were not.

Only a small proportion of children was taken to more than one provider and even fewer sought care in both provider sectors. The responses to where care was sought

first were not included in this analysis, since such reports may suffer from lower validity than the listing of all providers of care. Additional dimensions of health-seeking for child illness would help extend the understanding of the results and their potential limitations, but were not available in the dataset. These include the household member who first identified the child's illness, who had the final decision about seeking medical care, who took the child to the health provider, whether free public care was sought/received as well as the amount paid for consultation, medications, and laboratory tests. A study of expenditures associated with seeking diarrhoea treatment in a large Cairo hospital showed that the mean price per diarrhoeal episode (including direct and indirect expenditures) amounted to nearly 150 EGP. These expenditures caused a significant economic burden on households and may contribute to delays in health-seeking.[276]

Reports of health-seeking behaviours may be affected by social desirability bias. If respondents with lower socio-economic position scores were more likely to over-report care-seeking, such bias may have resulted in the lack of association seen between these variables. An affirmative response to whether care was sought for a sick child initiated a sequence of questions about the timeliness, location and treatment surrounding this care. If care was, in reality, not sought, this sequence provides multiple opportunities for the respondent to correct the original affirmative response. In this Chapter, an association between socio-economic position and the timeliness and location of care was shown. If social desirability bias caused the lack of association seen between socio-economic position and care-seeking, it would have to act in the opposite direction for timeliness and location of care (respondents with lower socio-economic position would have to systematically *under*-report timely care and private care) in order for these results to be identified. This seems unlikely.

Lastly, as in the analysis of maternal health-seeking, the correct estimation of associations in the presented models relies on the absence of unmeasured confounding. I conducted sensitivity analysis by including the categorical breastfeeding variable in models predicting health-seeking behaviour outcomes, and no meaningful change in effect estimates was observed (results not shown). I believe that perceived illness severity might have been one important source of confounding. The data contain no objective or subjective indicators of whether severity illness in children necessitated medical attention, but the occurrence of other illnesses during the recall period was used in multivariable analysis. While the survey provided no information about whether such multiple illnesses occurred as a part of the same episode or about their sequence of onset, a study among Indian and Nepali children showed that

diarrhoea and acute lower respiratory illness occurred simultaneously more than by chance alone.[270] The results showed that presence of other illnesses was a strong determinant of health-seeking behaviours, and that while imperfect, such period co-morbidities appeared to capture an element of child 'frailty' during the recall period.[269,277]

6.6 Conclusion

In contrast to the results of maternal health-seeking analysis, treatment seeking for child illnesses was not strongly socio-economically patterned in Egypt. However, among children who were taken for care, those with higher socio-cultural capital scores were more likely to receive timely care and those with higher household economic capital were more likely to be taken to private providers. Several other results are notable and help interpreting the findings. Younger children, and children with more than one illness during the recall period, had higher odds of receiving care. These factors may be related to perceived vulnerability and/or severity of illness, which in turn necessitated seeking medical care. Support for this explanation is bolstered by findings that children with either illness who had fever during the recall period were marginally more likely to receive timely treatment.

While the effect was not significant, the presence of multiple illnesses was negatively associated with the odds of seeking private care. For both illnesses, children for whom timely care was not sought were less likely to be taken to private providers. This effect may be a result of waiting for spontaneous resolution among families that do not have the resources to access care. The preference for public care when such improvement was not seen may be either due to perceptions of better clinical capacity in the public sector, or as a more affordable alternative. Public providers were more likely to be approached by families of children with more severe illness, regardless of timeliness of care-seeking. If true, this effect could have arisen due to various characteristics of the public compared to the private sector, such as clinical capacity, availability/affordability of medication, suitability of opening hours (particularly in emergencies), capacity for referral to higher levels of care, and/or perception of better quality of care.

In this analysis, neither measure of socio-economic position was directly constructed from the child's perspective. Sex is one inherent characteristic of the child which may act as an indicator of its societal status. A study of child curative health-seeking in Minia found that ill girls were less likely to be taken to a medical provider than

boys.[266] Likewise, crude tabulations in the 2008 DHS report showed that slightly higher proportions of male compared to female children were taken for treatment (ARI: 77% and 68%; diarrhoea: 57% and 54%, respectively).[115] In this Chapter's adjusted analysis, no association between child sex and illness reporting or help-seeking was identified. This lack of association could have two main reasons: bias in the reporting of health-seeking for girls, or a true improvement in the equitable treatment of girls, shown through a more complete adjustment for confounders. The latter explanation is more plausible in light of this Chapter's findings that compared to boys, girls were *more* likely to receive private treatment for diarrhoea. Smaller studies from the Upper Egypt region showed girls were less likely to be taken to private providers and that median expenditures for curative care of girls were lower than of boys.[197,266,278]

Finally, to improve the understanding of whether health-seeking behaviours may contribute to socio-economically-based inequalities in child health outcomes, two research directions could be pursued. First, children in rural areas obtained more timely care, and this care was more likely to be sought from private providers. These results are similar to findings of maternal care-seeking in the previous chapter. It would be important to determine whether, compared to urban regions, the patterns of health-seeking in rural areas are due to different perceptions of symptoms, objectively higher severity of illness, larger variation in the perceived quality of care between public and private providers, and/or lower availability of public care in rural regions. Second, a better understanding of the quality of care children receive when they seek medical care is needed. There is some evidence that male children were more likely to receive appropriate diarrhoea treatment from public providers,[265] and such gradients in quality of care may exist based on other socio-economic characteristics. Therefore, quality of care in a very broad sense of the concept should be explored, including the level of communication between the care takers and the health professionals, dignity and respect, medications and laboratory tests prescribed and purchased, and adherence to treatment instructions.

Table 6.1 Distribution of demographic and socio-economic variables in samples

Characteristics		All children <5 years old	Children with diarrhoea	Children with ARI
	Sample size (n)	*10,006*	*840*	*761*
Child age (months)	0 - 5 (%)	10.5	15.1	11.3
	6 - 11	12.3	27.8	19.3
	12 - 23	21.0	27.9	26.7
	24 - 35	19.4	15.3	15.8
	36 - 47	18.8	7.5	13.6
	48 - 59	18.0	6.4	13.3
	*X^2 p value**		*<0.001*	*<0.001*
Child sex	Male (%)	50.6	52.5	52.7
	Female	49.4	47.5	47.3
	*X^2 p value**		*0.260*	*0.245*
Child's breastfeeding status	Never (%)	3.0	3.1	3.9
	Previously	63.0	38.3	55.2
	Currently	33.5	58.5	40.5
	Missing	0.5	0.1	0.4
	*X^2 p value**		*<0.001*	*0.001*
Preceding birth interval	<24 months (%)	12.1	11.7	11.7
	24-47 months	33.5	32.1	36.4
	≥48 months	21.9	21.3	24.1
	Only child	32.5	34.9	27.8
	*X^2 p value**		*0.527*	*0.039*
Mother's age group	14-19 (%)	8.0	12.8	9.0
	20-24	33.1	34.4	30.8
	25-29	32.0	29.0	33.2
	30-34	16.6	16.0	17.6
	35-39	8.1	6.1	7.3
	40-49	2.2	1.7	2.1
	*X^2 p value**		*<0.001*	*0.670*
Mothers' household status	Female head (%)	81.9	81.2	81.8
	*X^2 p value**		*0.626*	*0.947*
Number of children <5 in household	1 (%)	39.5	43.0	39.7
	2	44.2	41.4	43.7
	3 or 4	16.3	15.6	16.6
	*X^2 p value**		*0.167*	*0.967*
Region	Urban (%)	36.5	39.5	41.3
	Rural	63.5	60.5	58.7
	*X^2 p value**		*0.139*	*0.048*
Month of interview	March (%)	22.5	33.2	42.0
	April	51.9	44.8	44.1
	May/June	25.6	22.0	13.9
	*X^2 p value**		*<0.001*	*<0.001*
Socio-cultural capital	Mean	0.016	-0.004	-0.044
	SE	0.013	0.026	0.030
	*T test p value***		*0.502*	*0.150*
Economic capital	Mean	0.047	0.029	0.019
	SE	0.014	0.026	0.028
	*T test p value***		*0.220*	*0.052*

SE: standard error. Complex survey design (weighting, clustering and stratification) was accounted for in calculations of proportions and sample sizes reported. ARI: cough with difficulty breathing which is chest related.
*Testing the hypothesis that users children for whom symptoms of diarrhoea/ARI in the two-week period before the survey were reported were drawn from the same population as children without these symptoms.
** T test p value testing that the difference in mean scores between children with and without symptoms of diarrhoea or ARI was 0.

Table 6.2 Analysis samples and child health-seeking behaviours among children <5 years of age

Health-seeking behaviour outcome		Samples and missing data*				Distribution of outcome in analysed sample and 95% CI
		Eligible sample	Eligible sample size	Missing data (%)	Analysed sample size	
Diarrhoea						
1.	**Reported illness**	All children	10,006	0.12%	9,994	8.4% (7.8 – 9.1)
2.	**Sought treatment**	All children for whom symptoms of diarrhoea were reported	840	-	840	62.0% (58.3 – 65.6)
3.	**Timely treatment**	All children for whom symptoms of diarrhoea were reported and who received treatment	521	0.38%	519	61.8% (56.6 – 66.8)
4.	**Treatment from private provider**	All children for whom symptoms of diarrhoea were reported and who received treatment	521	-	521	71.9% (67.2 – 76.2)
Acute respiratory infection (ARI)						
5.	**Reported illness**	All children	10,006	0.06%	10,000	7.6% (6.9 – 8.4)
6.	**Received treatment**	All children for whom symptoms of ARI were reported	761	-	761	78.5% (74.9 – 81.8)
7.	**Timely treatment**	All children for whom symptoms of ARI were reported and who received treatment	597	0.17%	596	62.0% (57.0 – 66.7)
8.	**Treatment from private provider**	All children for whom symptoms of ARI were reported and who received treatment	597	-	597	72.6% (68.2 – 76.6)

*Weighted sample sizes. Complex survey design was accounted for in calculations of proportions and confidence intervals. 95%CI: 95% confidence interval.

Table 6.3 Adjusted effects of socio-cultural capital and economic capital on child health-seeking behaviours for diarrhoea

Variable		Reported symptoms		Sought treatment		Timely treatment		Private treatment	
	Sample	*9,994*		*837*		*517*		*517*	
		OR (95% CI)	*p*	*OR (95% CI)*	*p*	*OR (95% CI)*	*p*	*OR (95% CI)*	*p*
Socio-cultural capital[1]		0.93 (0.80-1.07)	0.309	0.98 (0.71-1.35)	0.890	1.50 (0.98-2.27)	0.059	1.05 (0.70-1.57)	0.802
Economic capital[1]		0.99 (0.82-1.19)	0.894	1.33 (0.96-1.83)	0.082	0.93 (0.60-1.44)	0.747	1.99 (1.26-3.13)	0.003
Child age in months	0-5	0.56 (0.44-0.73)	<0.001	0.83 (0.50-1.39)	0.478	1.04 (0.59-1.83)	0.893	0.88 (0.42-1.81)	0.722
	6-11	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	12-23	0.59 (0.47-0.73)	<0.001	0.82 (0.54-1.25)	0.351	0.84 (0.49-1.45)	0.527	0.82 (0.45-1.50)	0.578
	24-35	0.41 (0.29-0.58)	<0.001	0.50 (0.31-0.81)	0.005	1.39 (0.71-2.72)	0.334	0.95 (0.45-2.01)	0.893
	36-47	0.20 (0.13-0.31)	<0.001	0.51 (0.28-0.93)	0.028	1.68 (0.77-3.70)	0.194	0.38 (0.17-0.84)	0.018
	48-59	0.18 (0.12-0.27)	<0.001	0.55 (0.29-1.06)	0.074	1.15 (0.42-3.15)	0.785	0.68 (0.28-1.63)	0.383
Child sex	Male	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	Female	0.91 (0.78-1.06)	0.204	0.97 (0.71-1.34)	0.861	1.11 (0.74-1.67)	0.626	1.50 (0.98-2.30)	0.061
Preceding birth interval	<24 months	1.02 (0.79-1.30)	0.895	0.72 (0.44-1.19)	0.200	1.37 (0.71-2.66)	0.349	0.71 (0.35-1.45)	0.348
	24-47 months	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	≥48 months	0.93 (0.73-1.17)	0.519	1.00 (0.62-1.62)	0.984	1.23 (0.65-2.30)	0.521	1.06 (0.52-2.18)	0.868
	Only child	0.93 (0.73-1.18)	0.551	0.94 (0.60-1.48)	0.790	1.14 (0.58-2.23)	0.704	1.40 (0.66-2.96)	0.377
Mother's age group	14-19	1.37 (1.01-1.85)	0.040	1.06 (0.63-1.78)	0.826	1.48 (0.70-3.13)	0.299	1.18 (0.53-2.66)	0.686
	20-24	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	25-29	0.89 (0.72-1.10)	0.272	0.98 (0.65-1.49)	0.941	1.17 (0.70-2.00)	0.556	0.81 (0.44-1.49)	0.498
	30-34	0.93 (0.71-1.22)	0.615	0.76 (0.45-1.28)	0.298	0.90 (0.45-1.80)	0.770	0.97 (0.44-2.13)	0.938
	35-39	0.69 (0.48-1.00)	0.049	1.07 (0.52-2.21)	0.815	0.87 (0.32-2.37)	0.781	0.65 (0.24-1.72)	0.381
	40-49	0.71 (0.41-1.23)	0.220	0.89 (0.26-2.98)	0.873	0.26 (0.07-0.97)	0.045	0.68 (0.16-2.87)	0.601
Mother female head status	Yes	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	No	0.91 (0.72-1.15)	0.422	0.98 (0.61-1.58)	0.939	0.53 (0.28-0.99)	0.049	1.41 (0.69-2.88)	0.347
Children <5 in household	1	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	2	0.86 (0.70-1.06)	0.164	0.83 (0.55-1.24)	0.359	0.89 (0.50-1.58)	0.695	0.82 (0.44-1.55)	0.545
	3/4	0.81 (0.62-1.06)	0.120	1.12 (0.61-2.06)	0.720	0.90 (0.42-1.93)	0.786	1.50 (0.63-3.54)	0.356
Region	Urban	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	Rural	0.79 (0.63-0.98)	0.032	1.29 (0.87-1.90)	0.200	1.74 (1.05-2.87)	0.031	1.15 (0.64-2.06)	0.644
Breastfeeding status	Never	1.33 (0.82-2.17)	0.245						
	Previously	1 (ref)							
	Currently	1.45 (1.09-1.94)	0.011						
	Missing	0.45 (0.06-3.40)	0.437						
Month of interview	March	2.02 (1.62-2.53)	<0.001					1.06 (0.62-1.80)	0.838
	April	1 (ref)						1 (ref)	
	May/June	1.01 (0.80-1.27)	0.947					0.60 (0.31-1.14)	0.121
Blood in stool	No			1 (ref)		1 (ref)		1 (ref)	
	Yes			2.25 (1.10-4.62)	0.027	0.86 (0.38-1.95)	0.718	0.63 (0.28-1.42)	0.261
Fever in recall period	No			1 (ref)		1 (ref)		1 (ref)	
	Yes			1.60 (1.08-2.38)	0.020	1.33 (0.84-2.11)	0.227	0.87 (0.50-1.51)	0.621
ARI in recall period	No			1 (ref)		1 (ref)		1 (ref)	
	Yes			2.19 (1.37-3.51)	0.001	0.63 (0.38-1.06)	0.082	0.92 (0.53-1.61)	0.773
Timely diarrhoea treatment	No							1 (ref)	
	Yes							2.08 (1.29-3.34)	0.003

OR: Odds ratio. P-value of Wald test. ARI: Acute respiratory infection. 95%CI: 95% confidence interval. Weighted sample sizes reported.

[1] Odds of health-seeking behaviour under investigation associated with one unit increase in score.

Table 6.4 Adjusted effects of socio-cultural capital and economic capital on child health-seeking behaviours for ARI

Variable		Reported symptoms		Sought treatment		Timely treatment		Private treatment	
	Sample	*9,999*		*760*		*596*		*596*	
		OR (95% CI)	*p*	*OR (95% CI)*	*p*	*OR (95% CI)*	*p*	*OR (95% CI)*	*p*
Socio-cultural capital[1]		0.85 (0.72-1.01)	0.066	1.20 (0.81-1.77)	0.360	1.23 (0.86-1.78)	0.261	0.95 (0.65-1.39)	0.789
Economic capital[1]		1.10 (0.89-1.35)	0.365	1.06 (0.70-1.61)	0.777	1.18 (0.81-1.73)	0.387	2.66 (1.57-4.52)	<0.001
Child age in months	0-5	0.63 (0.46-0.86)	0.004	1.70 (0.73-3.98)	0.221	1.27 (0.62-2.60)	0.509	0.85 (0.42-1.72)	0.653
	6-11	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	12-23	0.64 (0.49-0.83)	0.001	0.96 (0.54-1.71)	0.891	1.01 (0.58-1.74)	0.978	0.62 (0.33-1.14)	0.124
	24-35	0.33 (0.23-0.47)	<0.001	0.75 (0.40-1.42)	0.377	1.32 (0.72-2.42)	0.375	0.63 (0.31-1.27)	0.196
	36-47	0.28 (0.19-0.40)	<0.001	0.90 (0.45-1.78)	0.753	0.86 (0.46-1.60)	0.626	0.57 (0.28-1.17)	0.125
	48-59	0.28 (0.19-0.42)	<0.001	0.71 (0.36-1.38)	0.313	1.14 (0.56-1.29)	0.723	0.67 (0.31-1.43)	0.298
Child sex	Male	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	Female	0.88 (0.75-1.03)	0.111	0.69 (0.46-1.04)	0.076	1.04 (0.72-1.50)	0.854	1.01 (0.69-1.47)	0.964
Preceding birth interval	<24 months	0.85 (0.66-1.10)	0.216	1.41 (0.68-2.94)	0.377	1.28 (0.70-2.34)	0.427	0.66 (0.36-1.23)	0.191
	24-47 months	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	≥48 months	1.00 (0.79-1.27)	0.999	1.25 (0.72-2.18)	0.402	0.84 (0.50-1.43)	0.519	1.16 (0.65-2.07)	0.623
	Only child	0.72 (0.57-0.92)	0.008	0.88 (0.52-1.48)	0.621	1.16 (0.70-1.91)	0.565	1.25 (0.70-2.23)	0.442
Mother's age group	14-19	1.23 (0.88-1.71)	0.234	1.06 (0.53-2.14)	0.864	0.85 (0.40-1.82)	0.680	0.57 (0.25-1.34)	0.201
	20-24	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	25-29	1.06 (0.84-1.33)	0.617	0.88 (0.51-1.50)	0.637	1.41 (0.84-2.36)	0.193	0.92 (0.51-1.67)	0.787
	30-34	0.97 (0.74-1.27)	0.834	1.33 (0.70-2.56)	0.380	1.10 (0.60-2.03)	0.747	0.56 (0.29-1.06)	0.076
	35-39	0.79 (0.56-1.12)	0.190	1.18 (0.53-2.64)	0.687	1.89 (0.85-4.19)	0.118	0.90 (0.35-2.32)	0.826
	40-49	0.74 (0.43-1.26)	0.262	0.84 (0.27-2.59)	0.761	1.24 (0.35-4.41)	0.735	0.40 (0.11-1.49)	0.171
Mother female head status	Yes	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	No	0.97 (0.75-1.25)	0.770	1.18 (0.63-2.13)	0.578	1.40 (0.80-2.46)	0.235	1.23 (0.64-2.35)	0.531
Children <5 in household	1	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	2	0.94 (0.76-1.16)	0.557	1.37 (0.85-2.20)	0.190	0.85 (0.54-1.35)	0.485	0.96 (0.59-1.55)	0.866
	3/4	0.87 (0.64-1.18)	0.372	1.09 (0.53-2.24)	0.822	0.63 (0.33-1.21)	0.163	1.79 (0.80-4.01)	0.158
Region	Urban	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
	Rural	0.74 (0.57-0.95)	0.020	0.81 (0.49-1.34)	0.406	1.56 (0.98-2.50)	0.061	1.96 (1.18-3.27)	0.010
Breastfeeding status	Never	1.17 (0.75-1.83)	0.499						
	Previously	1 (ref)							
	Currently	0.67 (0.49-0.89)	0.007						
	Missing	0.95 (0.26-3.44)	0.937						
Month of interview	March	2.63 (2.10-3.30)	<0.001					0.96 (0.60-1.54)	0.871
	April	1 (ref)						1 (ref)	
	May/June	0.63 (0.46-0.85)	0.003					0.52 (0.26-1.07)	0.075
Fever in recall period	No			1 (ref)		1 (ref)		1 (ref)	
	Yes			3.24 (2.06-5.10)	<0.001	1.29 (0.79-2.10)	0.300	0.90 (0.52-1.56)	0.702
Diarrhoea in recall period	No			1 (ref)		1 (ref)		1 (ref)	
	Yes			0.79 (0.50-1.25)	0.312	0.85 (0.54-1.34)	0.485	0.71 (0.46-1.10)	0.122
Timely ARI treatment	No							1 (ref)	
	Yes							1.15 (0.75-1.76)	0.532

OR: Odds ratio. P-value of Wald test. ARI: Acute respiratory infection. 95%CI: 95% confidence interval. Weighted sample sizes reported.
[1] Odds of health-seeking behaviour under investigation associated with one unit increase in score.

Table 6.5 Adjusted sensitivity analysis of private treatment for diarrhoea and ARI among children taken to clinical providers

Variable	Sample	Private diarrhoea treatment 461		Private treatment for ARI 551	
		OR (95% CI)	*p*	*OR (95% CI)*	*p*
Socio-cultural capital[1]		1.00 (0.66-1.52)	0.999	0.95 (0.63-1.41)	0.791
Economic capital[1]		2.15 (1.33-3.46)	0.002	2.57 (1.50-4.42)	0.001
Child age in months	0-5	0.85 (0.40-1.82)	0.674	0.90 (0.44-1.84)	0.776
	6-11	1 (ref)		1 (ref)	
	12-23	0.83 (0.44-1.54)	0.547	0.60 (0.31-1.14)	0.120
	24-35	0.88 (0.40-1.97)	0.764	0.58 (0.28-1.19)	0.137
	36-47	0.34 (0.15-0.78)	0.011	0.54 (0.26-1.13)	0.102
	48-59	0.53 (0.22-1.30)	0.164	0.62 (0.28-1.36)	0.234
Child sex	Male	1 (ref)		1 (ref)	
	Female	1.35 (0.87-2.10)	0.181	0.95 (0.64-1.39)	0.777
Preceding birth interval	<24 months	0.52 (0.25-1.11)	0.089	0.64 (0.33-1.23)	0.179
	24-47 months	1 (ref)		1 (ref)	
	≥48 months	1.21 (0.56-2.62)	0.619	1.22 (0.67-2.21)	0.509
	Only child	1.47 (0.64-3.37)	0.359	1.24 (0.68-2.24)	0.479
Mother's age group	14-19	1.04 (0.46-2.38)	0.920	0.56 (0.24-1.34)	0.191
	20-24	1 (ref)		1 (ref)	
	25-29	0.79 (0.42-1.47)	0.453	0.92 (0.50-1.70)	0.784
	30-34	0.82 (0.34-1.96)	0.651	0.55 (0.28-1.08)	0.080
	35-39	0.49 (0.17-1.34)	0.164	0.85 (0.32-2.24)	0.748
	40-49	0.55 (0.12-2.65)	0.459	0.16 (0.04-0.68)	0.013
Mother female head status	Yes	1 (ref)		1 (ref)	
	No	1.17 (0.57-2.42)	0.670	1.11 (0.58-2.14)	0.752
Children <5 in household	1	1 (ref)		1 (ref)	
	2	0.84 (0.41-1.71)	0.628	0.99 (0.60-1.61)	0.956
	3/4	1.58 (0.62-4.01)	0.336	1.94 (0.83-4.52)	0.125
Region	Urban	1 (ref)		1 (ref)	
	Rural	1.13 (0.61-2.09)	0.700	1.84 (1.10-3.12)	0.021
Month of interview	March	0.96 (0.55-1.67)	0.873	0.94 (0.58-1.53)	0.806
	April	1 (ref)		1 (ref)	
	May/June	0.54 (0.28-1.05)	0.070	0.54 (0.26-1.11)	0.093
Fever in recall period	No	1 (ref)		1 (ref)	
	Yes	0.89 (0.50-1.59)	0.690	0.93 (0.52-1.64)	0.789
Blood in stool	No	1 (ref)			
	Yes	0.63 (0.27-1.46)	0.286		
ARI in recall period	No	1 (ref)			
	Yes	1.01 (0.55-1.86)	0.975		
Timely diarrhoea treatment	No	1 (ref)			
	Yes	2.04 (1.24-3.36)	0.005		
Diarrhoea in recall period	No			1 (ref)	
	Yes			0.63 (0.40-0.99)	0.048
Timely ARI treatment	No			1 (ref)	
	Yes			1.13 (0.73-1.76)	0.584

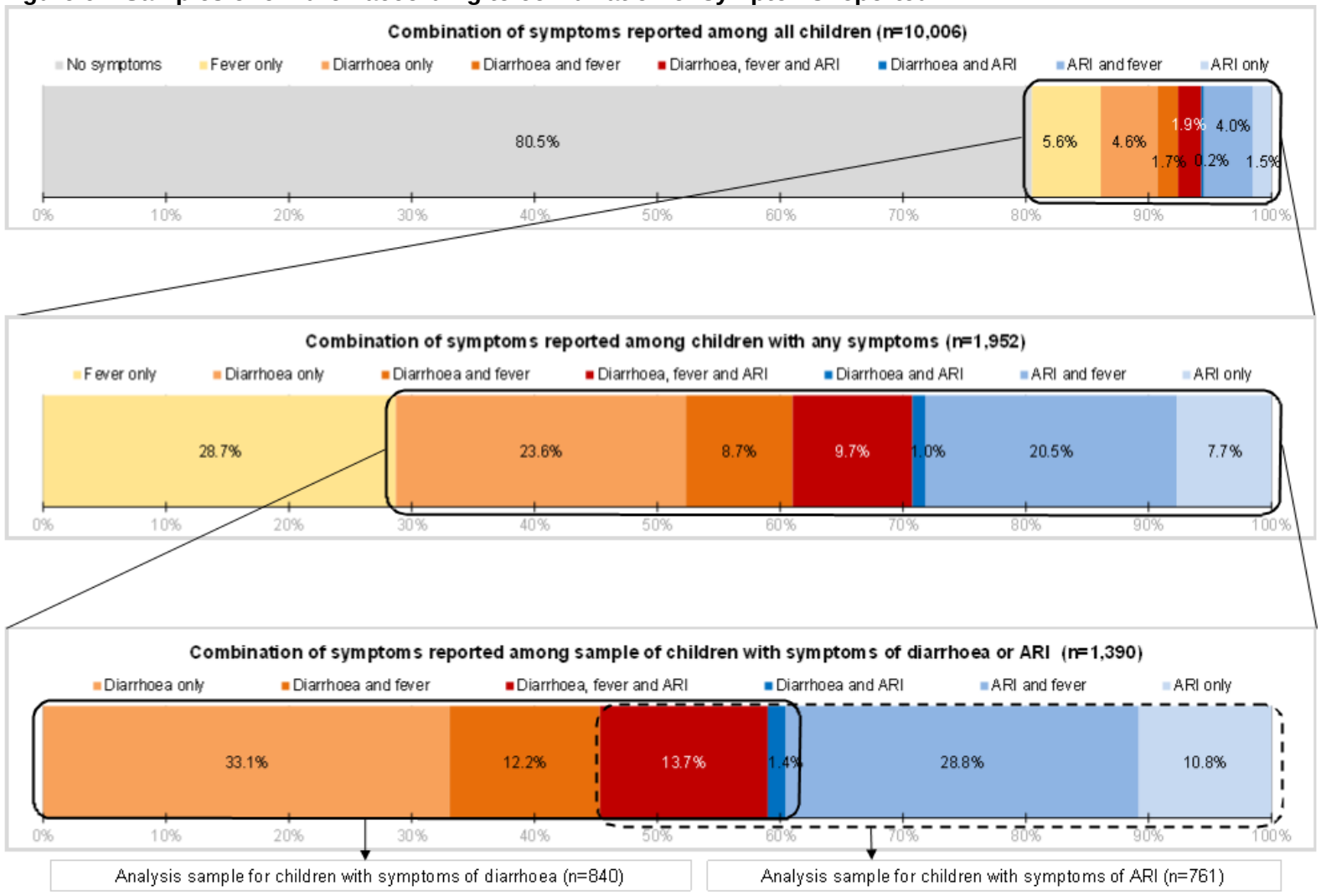
OR: Odds ratio. P-value of Wald test. ARI: Acute respiratory infection. 95%CI: 95% confidence interval. Weighted sample sizes reported. [1] Odds of health-seeking behaviour under investigation associated with one unit increase in score.

Table 6.6 Mediation: Adjusted effects of socio-cultural capital and economic capital on child health-seeking behaviours

Outcome	(1) Direct effect of socio-cultural capital	(2) Direct effect of economic capital	(3) Total effect of socio-cultural capital	(4) % of total effect of socio-cultural capital mediated by economic capital
	OR (95% CI)	*OR (95% CI)*	*ΣΔp (95% CI)*	*% (95% CI)*
Diarrhoea				
Sought treatment	0.98 (0.71 to 1.35)	1.33 (0.96 to 1.83)	0.02 (-0.03 to 0.08)	Not applicable
Timely treatment	1.50 (0.98 to 2.27)	0.93 (0.60 to 1.44)	0.07 (0.01 to 0.14)	0%
Private treatment	1.05 (0.70 to 1.57)	1.99 (1.26 to 3.13)	0.05 (0.00 to 0.10)	92% (0% to 100%)
ARI				
Sought treatment	1.20 (0.81 to 1.77)	1.06 (0.70 to 1.61)	0.03 (-0.02 to 0.07)	Not applicable
Timely treatment	1.23 (0.86 to 1.78)	1.18 (0.81 to 1.73)	0.07 (0.00 to 0.13)	28% (15% to 100%)
Private treatment	0.95 (0.65 to 1.39)	2.66 (1.57 to 4.52)	0.06 (0.01 to 0.11)	99% (64% to 100%)

OR: Odds ratio associated with one unit increase in score. ARI: Acute respiratory infection. 95%CI: 95% confidence interval.
ΣΔp: Total effect of socio-cultural capital expressed as sum of the changes in probability of outcome based on both indirect (mediated by economic capital) and direct effects.

Figure 6.2 Samples of children according to combination of symptoms reported

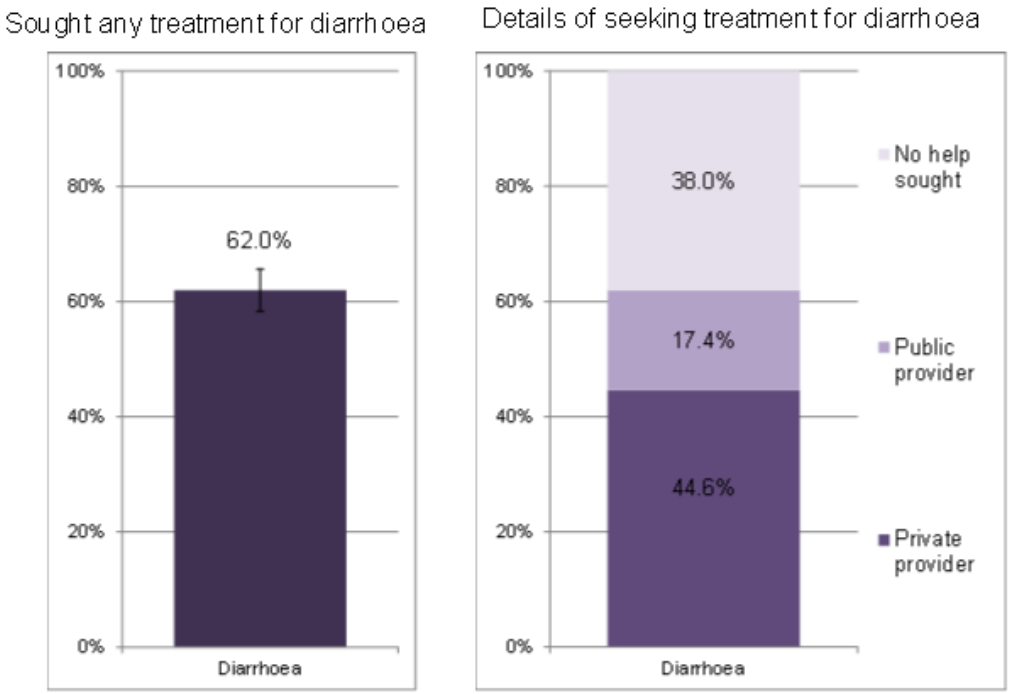


Symptoms of ARI describe a cough with faster or difficult breathing which was chest-related.

ARI: Acute respiratory infection. Weighted sample sizes reported.

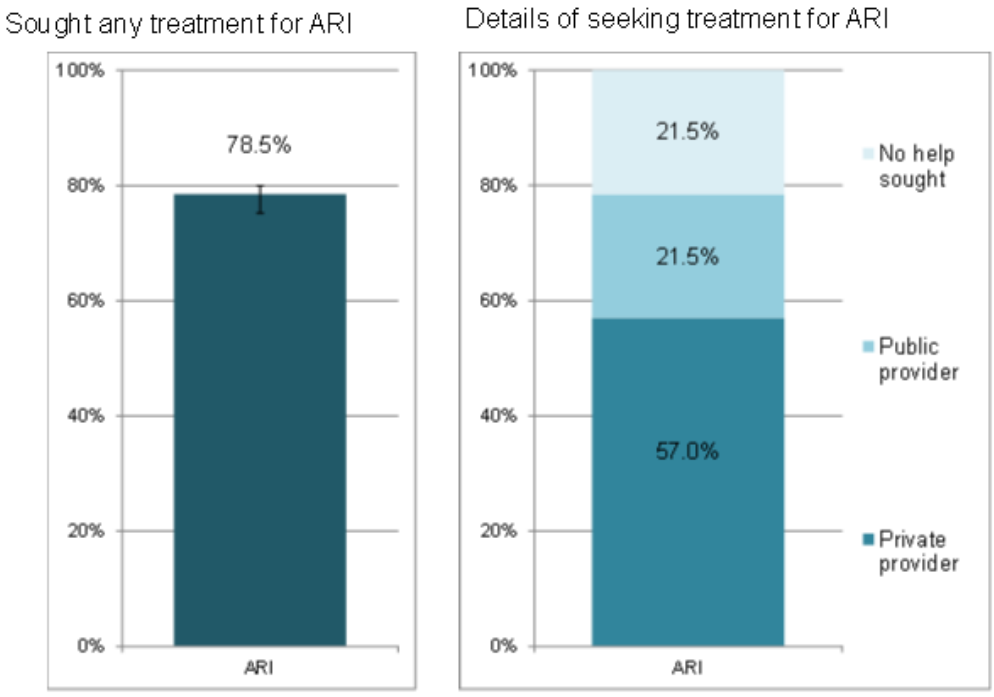
Figure 6.3 Levels of health-seeking behaviours for diarrhoea and ARI among children <5 years of age

A. Children with symptoms of diarrhoea



Weighted sample size: 840.

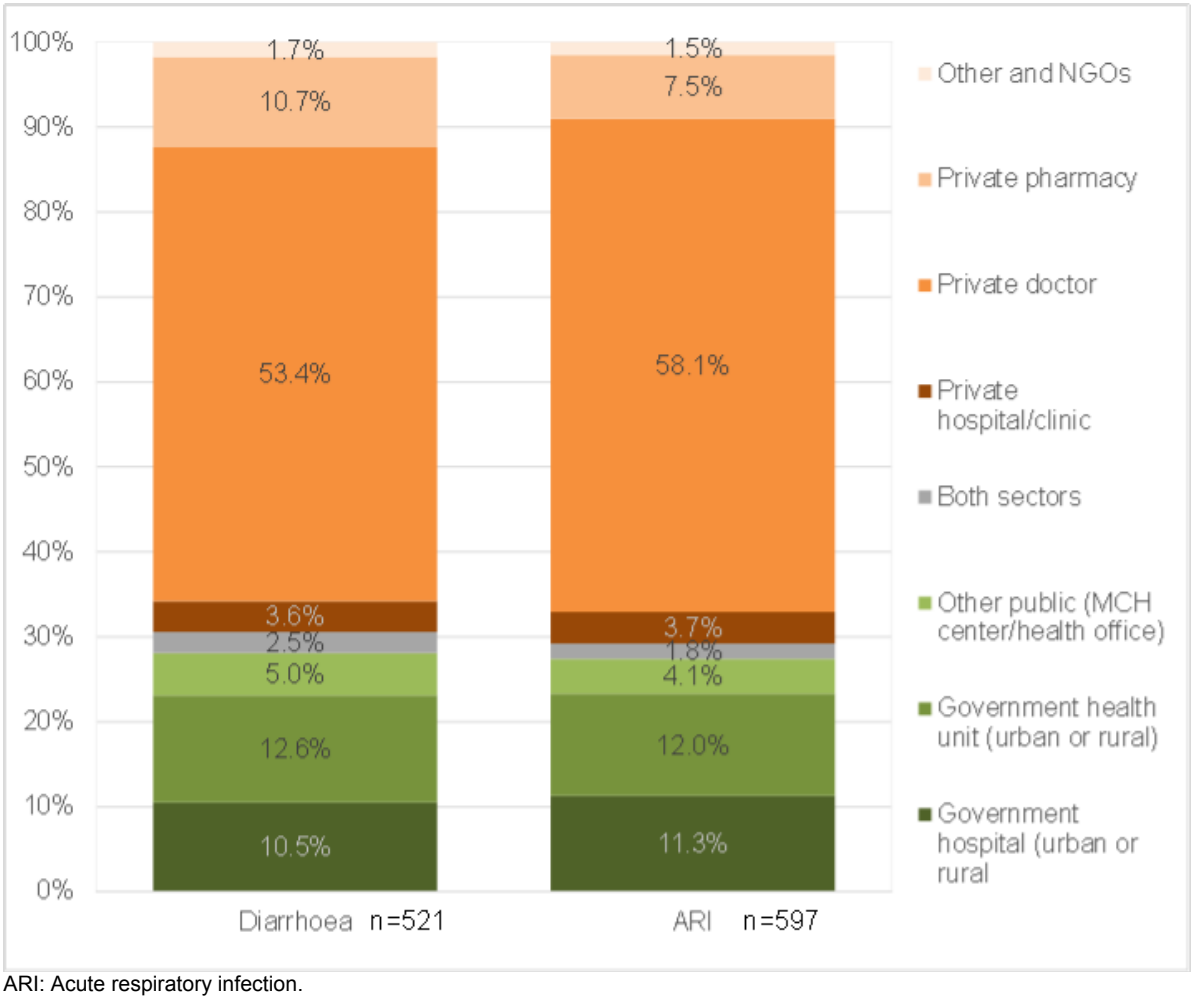
B. Children with symptoms of ARI



Weighted sample size: 761.

ARI: Acute respiratory infection.

Figure 6.4 Providers approached among children who were taken for care



ARI: Acute respiratory infection.

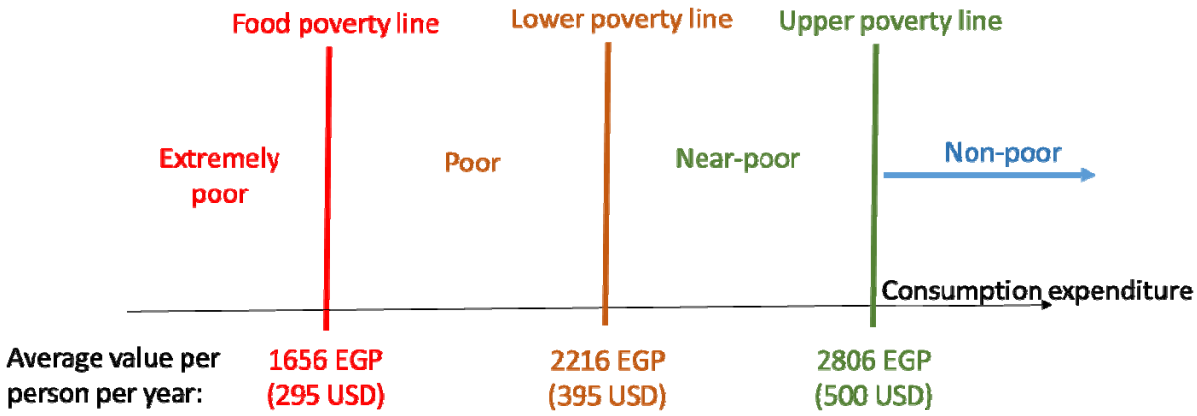
Section C. Socio-economic factors associated with health-seeking behaviours in poor households in rural Egypt

The third section of this thesis used a survey of rural poor households living in Assiut and Sohag governorates conducted in 2010-2011 to address objectives 4 and 5. Chapter 7 characterised the survey and the dataset which was used to analyse health-seeking behaviours. It provided the assessment of measurement invariance conducted and justified the necessity to construct different measures of socio-economic position among the rural poor than used in the DHS chapters. Further, it described the construction of these latent variables and statistical approaches used in analyses. Chapter 8 presented the results of maternal health-seeking analyses.

7 Upper Egypt CCT baseline survey 2010-2011

Household income, expenditures and consumption surveys (HIECS), conducted on a regular basis by the governmental Central Agency for Public Mobilization and Statistics (CAPMAS), have served as the main tools for assessing poverty levels in Egypt, and for developing proxies. Three poverty lines are used in Egypt (Figure 7.1). These are based on assessing consumption expenditure and capture the purchasing power needed to obtain basic life necessities (standards of living). They were developed by the World Bank based on prices of the basic food and non-food basket items, are adjusted for inflation, and reflect the location and composition of households. The extreme poverty line reflects the price of the minimum food basket. The lower poverty line (the main poverty threshold) additionally includes the cost of other basic needs. The upper poverty line is used to identify moderately poor people who may be at risk of poverty. The food poverty line and the lower poverty line are officially used in determination of eligibility for various governmental social assistance programmes.

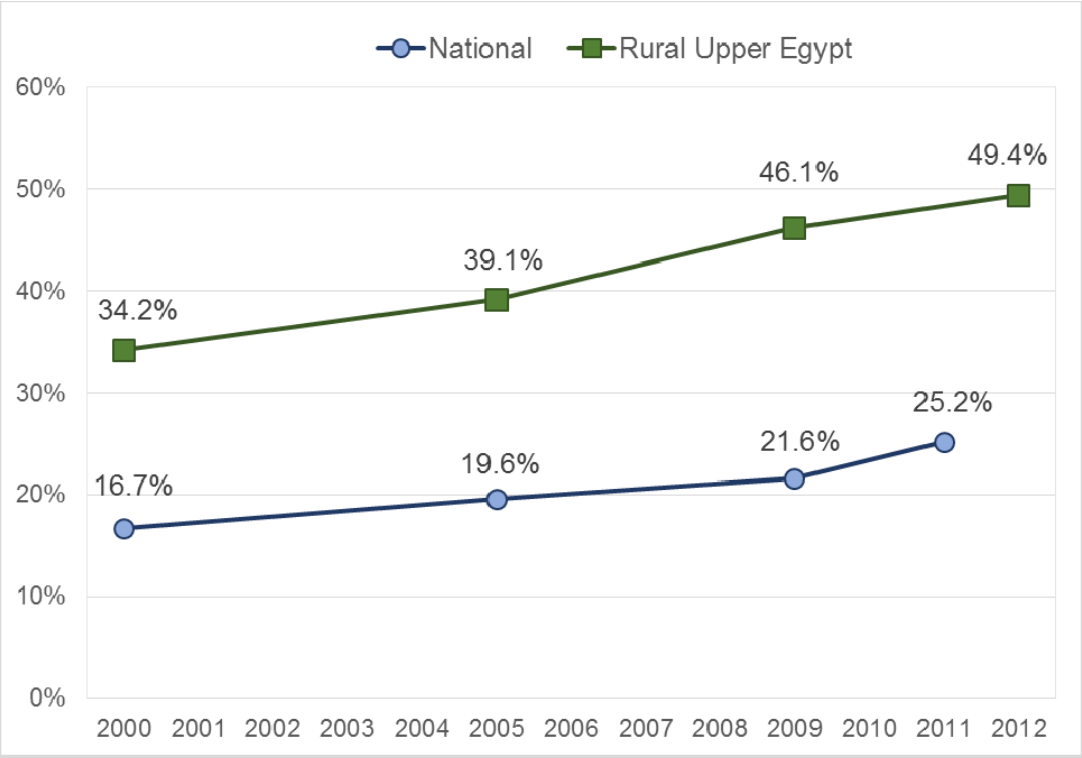
Figure 7.1 Schematic of poverty lines in Egypt and values in 2008/9



Based on the measurement of consumption expenditure and application of the poverty lines, the proportion of Egyptian population living in poverty has steadily increased since 2000 (Figure 7.2). The 2008/9 HIECS survey showed that 6.7% of the Egyptian population lived below the food poverty line, 21.6% below the lower poverty line (this includes the extremely poor) and 19.2% between the lower and the upper poverty line.[279] In total, this means that 40.8% of the population lived in or at-risk of poverty. The geographic distribution of the poor was unequal, and poverty was heavily concentrated in rural areas. Rural Upper Egypt, which accounted for 26.6% of the total population at the time of the 2008/9 survey, was home to 71.5% of the extremely poor,

55.8% of the poor and 33.2% of the near poor. It was the region most heavily affected by poverty in Egypt. The concentration of poverty in this region has increased from 66% of the extreme poor, 51% of the poor and 31% of the near-poor in the country in 2005.[280]

Figure 7.2 Proportion of population living below the lower poverty line nationally and in rural Upper Egypt, by year of survey



Sources: [279,281-284].

7.1 Upper Egypt CCT baseline survey characteristics

The dataset used in this thesis section was collected as a baseline study prior to the implementation of a conditional cash transfer (CCT) programme pilot. The CCT programme ("Minhat el Usra" or "Family stipend") was intended to target poor families in Sohag and Assiut governorates in Upper Egypt. The CCT programme envisioned requiring the fulfilment of several conditionalities related to child education and health in exchange for regular cash transfers disbursed to female heads of households. For the programme's two-year pilot, 65 poorest villages in Sohag (33) and Assiut (32) governorates were identified. Appendix F shows governorate maps and photos of selected villages. These villages were chosen because they were included in another governmental initiative to upgrade infrastructure in the poorest villages in Egypt, called "Alf Karyia" (1,000 villages).[285] A survey of households conducted among the

poorest 151 villages in the first stage of the 1,000 villages programme showed that more than two thirds of households lived below the food poverty line (specifically, 64% in Assiut and 70% in Sohag). The share of food from total household expenditure in the households residing in these 151 villages reached 65%.[286] Egypt's Ministry of Social Solidarity (MOSS), the governmental agency responsible for the implementation and funding of the CCT programme had planned to start the Upper Egypt pilot in February 2011. The stepwise design of the pilot programme involved selecting half of the 65 villages to start in Year 1 of the program and incorporating the other half in Year 2. The randomisation of the villages into these two phases was conducted by lottery draw.

In preparation for the pilot, families in the 65 selected villages were asked in May 2010 to apply for the programme in an open call for applications. Families residing in the targeted villages who had young or school-age children (under 18 years) in the family unit, and fulfilled at least one of the following three requirements: (1) low-income or sporadic income; (2) own less than 1 feddan of land (approximately 1 acre); or (3) having someone in the family with a chronic health condition were eligible to apply. In total, applications to the program were received from 44,213 families. All applicant families were visited by a social worker who collected information for the poverty assessment questionnaire, using a proxy-means targeting formula developed by the MOSS. This proxy means formula was based on the HIECS to approximate the three poverty lines. It includes 17 components and their respective coefficients (Table 7.1). The numeric cut-off thresholds reflecting the three poverty lines were not in the public domain.

Table 7.1 Ministry of Social Solidarity poverty targeting formula in 2010

Number	Coefficient	Indicator
1	4.988	Constant
2	- 0.064	Household size
3	- 0.333	% children <15 years in household
4	-0.189	Crowding (persons per room)
5	0.067	Ownership of private toilet
6	0.103	Type of dwelling: villa/apartment or more
7	0.067	Type of dwelling: independent apartment
8	0.037	Type of dwelling: independent rural house, red bricks
9	0.061	Ownership of a regular washing machine
10	0.162	Ownership of an automatic washing machine
11	0.051	Ownership of colour TV
12	0.183	Ownership of a mobile phone
13	0.033	Education of head of household: university
14	- 0.028	Education of head of household: illiterate
15	0.063	Work status of head of household
16	0.004	Amount of monthly phone receipt
17	0.010	Amount of monthly electricity receipt
18	0.075	Place of residence

As shown in Table 7.2, the results of the poverty assessment among the applicant households found that a total of 25,200 families were living below the lower poverty line, of which 13,221 were found to be extremely poor and 11,979 were found to be poor (between the food poverty line and the lower poverty line). 16,711 families were found to be near-poor or non-poor (these two categories were collapsed). The remaining 2,302 families were excluded either because they did not reside in one of the targeted villages, or did not have children under the age of 18. The 41,911 families that fulfilled the criteria for application (irrespective of their poverty level) were the target population of the baseline survey. The sample was stratified based on poverty levels and programme intervention phase.

Table 7.2 Number of households who applied to CCT program, by governorate and poverty level

Poverty level	Governorate		Total
	Assiut	Sohag	
Extremely Poor	7,553	5,668	13,221 (31.5%)
Poor	6,622	5,357	11,979 (28.6%)
Near/Non-poor	9,380	7,331	16,711 (39.9%)
Total	**23,555**	**18,356**	**41,911 (100.0%)**

7.1.1 UECCTBS sample selection procedures

The Upper Egypt CCT baseline survey (UECCTBS) was conducted with the objective of providing estimates of key indicators related to the CCT program intervention for the group as a whole and for the three poverty groups (extremely poor, poor and near/non-poor) separately. The three key impact evaluation indicators were: (1) absolute increase of 5% in girls' school attendance; (2) absolute decrease of 5% in child stunting; and (3) absolute decrease of 5% in child diarrhoea. The number of selected households was not proportional to the size of the poverty groups and as a result, the sample was not self-weighting for estimates of the entirety of the population of households that applied for the CCT.

Approximately 30% of the primary programme beneficiaries (the extreme poor) were included in the baseline sample (4,000 households), 10% of the poor (1,000) and 5% of the near/non-poor (1,000). It included a total of 6,000 households, 3,000 from Phase I villages and 3,000 from Phase II. Randomization of villages into Phase 1 and Phase 2 of intervention was conducted before the baseline data collection took place in order to calculate sample size but was not made public until after the data collection had been completed. The number of households interviewed in each village was a constant proportion of each poverty group in the target sample. Within each village and poverty

group, simple random sampling was used to identify households that were included in the baseline survey sample.

The survey non-response rate was minimal (2.92%, n=175 households). The main reasons were: (1) permanent residence in a non-targeted village (the applicants from these villages came and stayed only for the period of the application and poverty assessment); (2) duplication of record (household submitted more than one application); (3) enumerators could not locate the family address within the village and (4) a single case of refusal. No replacement households were visited if the selected household was not available or unwilling to participate in the baseline survey. A total of 5,825 households were successfully interviewed and comprise the baseline sample. These households contained 37,078 individuals.

7.1.2 Survey tools and procedures

External enumerators, many of whom had previous experience with data collection on the Egypt DHS, were recruited for the data collection. They received training during a three-day workshop in December 2010. The content of the workshop included basic information about the CCT programme, contextual information about Upper Egypt, and detailed instructions on completing the questionnaire. They were supervised by Social Research Center (SRC) staff through home visits of selected households. The main questionnaire contained several modules and defined a household as a group of people who shared meals. The preferred respondent was the female head of household (wife and mother of children, wife/stepmother, grandmother or oldest daughter) and the second preferred respondent was the male head of household. The same respondent answered all modules of the questionnaire. As a part of the baseline survey, anthropometric data (height/length, weight, waist circumference) was collected for the female head of household and children under six-years of age. Survey teams consisted of a supervisor, field editor and 10 enumerators (including a female anthropometric data collector). Fieldwork in Assiut started on Saturday, December 18, 2010 and ended on Saturday, January 1, 2011 (15 working days). Fieldwork in Sohag governorate started on Tuesday, January 11, 2011 and ended on Monday, January 24, 2011 (14 working days).

Data entry took place at the SRC in Cairo between March and May 2011. The data was entered by trained data entry team (10 clerks) and a supervisor. The main questionnaire was single-entered and anthropometry measurements were double-

entered. I reviewed data quality between November 2011 and April 2012 (six months, with two visits at the SRC in Cairo). Potential mistakes in every variable in the single-entered data were identified based on an algorithm I wrote to identify three potential discrepancies: (1) eligible for a response, but no response recorded; (2) not eligible for a response, but a response was recorded; (3) value entered was outside of specified range or impossible/highly improbable, or inconsistent with responses to other questions. When mistakes were identified, the variables in question or entire questionnaire modules were cross-checked against the paper questionnaires and corrected in the dataset if possible (Table 7.3). In total, I reviewed one or more variables on 2,103 questionnaires (36% of the sample). In consideration for the planned analysis of health-seeking, the two relevant modules (women's health and children's health) were reviewed in full if any potential discrepancy in the data was identified.

Table 7.3 Main questionnaire modules and data review strategy

Module	Type	Review approach	Number of questionnaires reviewed
Household member roster and their education	IND	If more than 3 discrepancies per household – reviewed entire module for all members of household. If ≤2 discrepancies per household, reviewed the variable affected among individual records	67 households 109 individuals
Employment	IND	If any discrepancy in the module identified, entire module reviewed.	209
Income	IND	If any discrepancy in the module identified, entire module reviewed.	61
Women's health	IND	If any discrepancy in the module identified, entire module reviewed.	261
Women's status	IND	If any discrepancy in the module identified, entire module reviewed.	150
Children's health	IND	If any discrepancy in the module identified, entire module reviewed.	203
Individual health	IND	If any discrepancy in the module identified, entire module reviewed.	217
Child Play	HH	No discrepancies identified – no review conducted.	-
Dwelling	HH	If any discrepancy in the module identified, entire module reviewed.	34
Assets	HH	If more than 3 discrepancies in a household – reviewed entire module. If ≤2 discrepancies per household, reviewed the variable(s) identified	89
Migration	HH	No discrepancies identified – no review conducted.	-
Assistance	HH	If any discrepancy in the module identified, entire module reviewed.	274
Expenditures	HH	Not reviewed.	-
Debt	HH	If any discrepancy in the module identified, entire module reviewed.	323
Nutrition	HH	If any discrepancy in the module identified, entire module reviewed.	37
Programme	HH	If any discrepancy in the module identified, entire module reviewed.	69

IND – Individual (one record per person). HH – household (one record per household).

7.1.3 Ethics

The collection of the Upper Egypt CCT baseline survey was approved by the Institutional Review Board of the American University in Cairo (Appendices B and G). Enumerators informed survey participants that they were randomly selected for this survey as a family which applied for the CCT programme. The informed consent involved informing respondents that their participation on the survey was not linked with their eligibility for the CCT programme or the transfer amount. Respondents were also assured that the information, opinions and anthropometric data that were collected would remain confidential and be used for solely for scientific purposes. They were told that they could stop the interview at any point and were provided a copy of the consent form on which the enumerator indicated their agreement (if obtained) and the telephone contact of the principal investigator. The analysis of these data was approved by the Research Ethics Committee of the London School of Hygiene and Tropical Medicine, UK.

7.1.4 Comparison of burdens of poverty

The aim of this analysis is to characterise the villages selected for the CCT programme and the households which applied to the program by 1) assessing the material deprivation in rural Upper Egypt in general and 2) comparing the burden of poverty between the extremely poor and the poor households. When possible, the data were compared to the general population in rural Upper Egypt, based on analysis of the Demographic and Health Survey 2008 (DHS) or results of analyses from other recent surveys (i.e., HIECS 2008/9).

The analysis was conducted based on two approaches: the Progress-Out-of-Poverty™ method developed by Grameen Bank to compare the prevalence and depth of household-level poverty, and the Bristol child deprivation method to compare the burden of deprivation on children living in households in the two poverty bands. The results of these analyses are presented in Appendix H. Briefly, among the 5,825 households surveyed, 14.3% were headed by a female (i.e., there was no adult male in the household). The mean level of crowding was higher in extremely poor households compared to poor and near/non-poor households (Table 7.4). However, even in near/non-poor households, the crowding was higher than among the poorest household wealth quintile nationally (2.0 persons per bedroom) or in rural Upper Egypt (1.8), based on the 2008 DHS or in the average crowding in the 151 villages in Phase I

of the 1,000 villages initiative (Assiut: 4.5, Sohag: 4.6).[286] The findings confirmed that households which were assessed to be extremely poor or poor suffered from similarly extreme burdens of deprivation. On the basis of this analysis, I decided to include households in both poverty categories in the analysis of maternal and child health-seeking among poor rural households.

Table 7.4 Characteristics of households, by poverty level

Poverty level	Extremely poor	Poor	Near/ Non-poor
n (households)	*3,884*	*953*	*988*
Household membership composition, by age			
Mean number of children (<5 years) per household	0.80	0.70	0.60
Mean number of young people (<20) per household	4.38	3.36	2.66
Mean number of older people (60+) per household	0.16	0.18	0.23
Mean number of persons per household	6.8	5.8	5.2
Crowding (persons per bedroom in the dwelling)			
Mean crowding	4.6	3.9	3.4
Proportion of adults (>18) by ever-attendance of education			
n (males >18 years)	*4,634*	*360*	*353*
Proportion of males ever attended school	60.1%	68.0%	71.4%
n (females >18 years)	*4,809*	*770*	*742*
Proportion females ever attended school	27.4%	34.9%	40.8%

7.2 Measurement of socio-economic position on the UECCTBS

To analyse the socio-economic determinants of health-seeking behaviour in the UECCTBS sample, I considered whether the two latent variables developed in the analysis of the DHS can be identified in this dataset. First, I assessed whether the latent variables socio-cultural capital and economic capital existed in the sample of DHS households residing in Upper Egypt. If these socio-economic position variables were applicable to this geographic region, I assessed whether they existed in the UECCTBS sample from Assiut and Sohag. Analyses of measurement invariance and construction of latent variables were conducted in MPLUS v7.11.

7.2.1 Measurement invariance

Assessment of measurement invariance can address several questions. First, it can examine whether the same latent construct (in the sense of its meaning) is measured across different groups. Second, it can assess whether the latent measure has the same structure in the various groups – i.e., whether the strength of the relationship between each observed variable and the latent construct is equal across the groups. Third, it can compare whether the reliability of each observed measure is equivalent

across groups (whether the error terms and covariances are the same); in other words, whether the extent of explained variance for each observed item is the same across the groups. If the error variance is unequal, groups can still be compared on the latent variable, but this is measured with a different amount of error between groups. Models incorporating all three of these assessments are called full uniqueness measurement invariance models or strict factorial invariance.[287]

To use the socio-cultural capital and economic capital latent variables in analyses within the population of Upper Egypt, it was necessary to evaluate whether the latent constructs have the same meaning and structure in Upper Egypt compared to the rest of Egypt. If such equivalence of meaning and structure existed, measurement invariance is said to exist between the groups.[288] Invariance is achieved if measurement parameters function equivalently in the compared groups. As presented in the Chapter 4, the two latent variables showed a good measure of fit on the nationally representative sample of women with a birth in the five years preceding the 2008 DHS (pooled sample, Table 7.5).

The fit of the two-group models of each latent construct was assessed separately using the most restrictive model (all model parameters fixed to be equal between the two groups). This is the strictest comparison that can be drawn to assess measurement invariance.[289] The results of this assessment for both latent socio-economic position constructs are presented in Table 7.5. The fit for both variables, as shown by the goodness of fit indices (CFI, TLI and RMSEA), provided evidence for measurement invariance. Chi-square test as a measure of goodness of fit was not used in the assessment of measurement invariance as large sample sizes can sometimes cause that a reasonable model is rejected.[290] The results showed that the meaning of the two constructs of socio-economic position and their measurements were equal between the two groups. The latent constructs were measured identically across the two groups and the groups can therefore be compared on their latent variables scores.

Table 7.5 Comparison of goodness of fit criteria for pooled sample and group CFA, 2008 DHS (n=7,896)

Latent variable	CFI	TLI	RMSEA
Socio-cultural capital			
Pooled sample	0.999	0.998	0.011
Two group sample (Upper Egypt compared to rest of Egypt)	0.966	0.962	0.051
Economic capital			
Pooled sample	0.981	0.972	0.050
Two group sample (Upper Egypt compared to rest of Egypt)	0.970	0.963	0.055

CFI: Comparative index fit. TLI: Tucker Lewis index. RMSEA: root mean square error of approximation.

Both socio-economic position variables were found to be invariant, which means that they captured the same latent construct and exhibit acceptable measures of goodness of fit estimates in the strict, invariance models. Because the meaning and the measurement structures were invariant, these socio-economic position latent variables could be constructed in Upper Egypt and compared with latent variables in the rest of Egypt. However, this does not necessarily mean that these variables display the same mean and dispersion (factor variance) in the two population groups.[291] The comparison of population heterogeneity showed that both socio-cultural capital and economic capital score means were lower among households residing in Upper Egypt compared to rest of the households in Egypt, as expected because of this region's lower level of socio-economic development (Table 7.6).

Table 7.6 Comparison of latent variable levels and dispersion, 2008 DHS

Latent variable	Sample size*	Mean*	SE*	95% CI*
Socio-cultural capital				
Pooled sample	7,896	0.027	0.011	0.002 to 0.049
Upper Egypt	2,990	-0.139	0.019	-0.178 to -0.100
Non-Upper Egypt	4,906	0.128	0.014	0.099 to 0.156
Economic capital				
Pooled sample	7,896	0.064	0.013	0.037 to 0.089
Upper Egypt	2,990	-0.183	0.024	-0.230 to -0.136
Non-Upper Egypt	4,906	0.214	0.016	0.183 to 0.245

**svyset* was applied to account for sampling weights, clustering and stratification.
95%CI: 95% confidence interval. SE: Standard error.

Next, I considered the equivalence of meaning and structure for the two latent socio-economic position variables in the UECCTBS sample. As with the DHS analysis, this assessment was conducted on a sub-sample (2,254 households) where the female head of household had a birth in the five-year period preceding the survey. Sample weights, village clustering and stratification (two poverty levels) were accounted for in all analyses. The aim of the analysis was to construct the two latent socio-economic position measures in this sample. If these latent constructs existed, I would conduct measurement invariance comparing the nationally-representative DHS sample to the UECCTBS, and the DHS Upper Egypt sample to the UECCTBS.

7.2.1.1 Socio-cultural capital

The five observed variables underlying the latent construct of socio-cultural capital were equivalent to the DHS dataset, except for the employment and education of the husband. The DHS collected information on the woman's husband (irrespective of the status of the marriage widowed, divorced, or separated), while the UECCTBS only collected information on current household members. For 15 women whose husbands

did not reside with them in the same household at the time of the survey, I used the information of the oldest adult male in the household. Information about the husband or male head of household was missing for 87 women. The resulting latent variable of socio-cultural capital showed acceptable goodness of fit statistics in the UECCTBS sample of poor women. However, woman's employment status did not have a significant standardised factor loading and woman's employment and husband's occupation had factor loading below the recommended 0.2 (Table 7.7).

Table 7.7 Socio-cultural capital measurement model (UECCTBS, n=2,254)

Component variables	Distribution	Standardized factor loading (SE)
*Woman: Years of education**		
Mean *(95% CI)*	2.50 (2.15-2.84)	0.60 (0.07)
Woman: Literacy		
Illiterate *(column %)*	70.7	0.64 (0.08)
Reads/writes with difficulty	8.1	
Reads/writes easily	20.9	
Missing	0.3	
*Woman: Employment status**		
Currently works (%)	4.3	0.07 (0.06)
*Husband: Years of education***		
Mean *(95% CI)*	4.92 (4.55-5.29)	0.68 (0.07)
Husband: Occupational category		
Not in employment *(column %)*	7.3	0.15 (0.02)
Unskilled manual	14.9	
Skilled manual	19.8	
Services	7.3	
Agriculture, employed	35.3	
Agriculture, self-employed	3.5	
Sales	3.2	
Clerical	3.5	
Professional	1.7	
Missing	3.5	
CFI = 0.989, TLI = 0.945, RMSEA = 0.031		

95%CI: 95% confidence interval. SE: Standard error. *No missing data. **Missing data for 87.
CFI: Comparative index fit. TLI: Tucker Lewis index. RMSEA: root mean square error of approximation.

Next, I considered the measurement invariance of the socio-cultural capital latent variable between the UECCTBS sample of poor households and the two DHS samples (complete sample and residents of Upper Egypt only). The results of these analyses are shown in Table 7.8 and showed that despite the fact that the five observed variables appeared to capture a latent construct in the UECCTBS sample, the items measuring this construct functioned differently among the UECCTBS sample than in the nationwide DHS sample and the DHS subsample from Upper Egypt.

Table 7.8 Strict invariance comparison for socio-cultural capital

Comparison	CFI	TLI	RMSEA
DHS all and UECCTBS	0.718	0.686	0.141
DHS Upper Egypt and UECCTBS	0.609	0.565	0.142

CFI: Comparative index fit. TLI: Tucker Lewis index. RMSEA: root mean square error of approximation.

7.2.1.2 Economic capital

The construction of the ten observed variables in the UECCTBS was equivalent to the DHS dataset. The resulting latent variable of economic capital did not display acceptable goodness of fit statistics among the UECCTBS sample of poor women with birth in <5 years prior to survey (Table 7.9). The ten observed variables did not capture a latent construct in the UECCTBS sample.

Table 7.9 Economic capital measurement model (UECCTBS, n=2,254)

Component variables	Distribution	Standardized factor loading (SE)
Household utilities		
Piper water in dwelling *(%)*	74.9	
Flush toilet *(%)*	1.6	
Household asset ownership		
Refrigerator *(%)*	40.2	
Car *(%)*	<0.1	
Mobile phone *(%)*	54.7	
Colour TV *(%)*	42.7	Not applicable
Water heater *(%)*	1.7	
Automatic washing machine *(%)*	0.7	
Household service ownership		
Bank account *(%)*	0.9	
Household crowding		
<1.5 persons/bedroom *(%)*	0.5	
CFI = 0.921, TLI = 0.885, RMSEA = 0.034		

95%CI: 95% confidence interval. SE: Standard error. No missing data.
CFI: Comparative index fit. TLI: Tucker Lewis index. RMSEA: root mean square error of approximation.

7.2.2 Innovative measurement of socio-economic position

The results of the measurement invariance assessment concluded that the two latent variables used in analysis of the DHS, socio-cultural capital and economic capital either could not be constructed or did not function equivalently in the UECCTBS sample. This result was expected. The characteristics of poor households in the UECCTBS sample were much more homogeneous than nationally. The average education level in the UECCTBS sample was substantially lower (mean number of years of woman's education was 2.5 compared to 8.3 nationally, 70.9% of women on the UECCTBS reported being illiterate compared to 27.5% nationally), and a higher proportion of male heads of household were employed in agriculture (35.3% compared to 9.5% nationally). Similarly, the ownership of major household assets was lower on the UECCTBS sample compared to national levels: 40.2% versus 91.4% owned a fridge, 1.6% versus 44.4% had access to a flush toilet in the dwelling, and 0.5% had crowding levels less than 1.5 persons per bedroom versus 48.6% nationally. This comparison showed the necessity of constructing more suitable and targeted measures of socio-economic position in the UECCTBS sample of poor households. However, it also meant that the analysis of how socio-economic position variables were associated with health-seeking behaviours on the UECCTBS would not be directly comparable to the results of the DHS analysis presented in Section B of the thesis.

The aim of the following analysis was to examine the latent structure of variables capturing socio-economic circumstances in the UECCTBS sample and to construct latent variables with acceptable statistical properties. I hypothesised that to do so successfully in this sample of rural poor households, a broader spectrum of observed indicators capturing resourcefulness will need to be included. Although the construction of the latent variables was conducted empirically, insofar as this exercise was limited to previously collected data, I approached the selection and derivation of observed variables to include in consideration through two conceptual lenses: women's empowerment and intra-household resource dynamics. This conceptualisation of socio-economic position beyond traditional indicators such as asset ownership and educational achievement was based on Hausmann-Muela's observation that "[t]o a great extent, health-seeking of households depends on their capacity and possibility at a specific moment to mobilise resources, both in material and social or symbolic terms."[56] I thus aimed to capture the operationalisation of the scarce economic resources available to poor households and of the social resources of female heads of household.

I conducted a broad literature review in order to identify variables potentially capturing such household-level utilisation of resources. This review spanned gender and women's studies with particular focus on Middle East contexts [292-295] and development in general [296,297]; economic literature examining household dynamics [298] and intra-household allocation of resources, [299-301] as well as global experience from evaluations of social policy and social protection programmes.[180,302] The social capital of the female head of household, her mobility and involvement decision-making are thought to be particularly important in relation to health-seeking behaviour, both for herself and her children.[303-306] However, higher mobility and decision-making are not unilaterally positive indicators of woman's empowerment. Research into the burdens of poverty has shown that female heads of poor households shoulder debilitating amounts of responsibility with limited resources to do so, creating additional conflict and other negative coping strategies (debt, undignified employment, etc.).[300,307] This phenomenon has been previously described in Egypt.[308]

In terms of the household dynamics lens, my approach stemmed from acknowledging that while household members are not stand-alone agents, neither do they possess equal powers of decision-making, income-earning potential or consumption needs and preferences.[309] Therefore, I aimed to construct variables capturing positive household dynamics, and incorporated the existence, contribution and extent of cooperation among other household members to achieve goals within an environment of insufficient resources. The underlying concept of household resourcefulness was the extent of household-level social cohesion, by considering all members and their interconnected, but sometimes conflicting, social and economic interests. In Egypt, as in many other countries, the primary responsibility for the care and health-seeking of children falls to women.[4,269] In the extremely constrained economic circumstances of poor households in Upper Egypt, female heads of households must use their bargaining power within in the household to prioritise such health-related needs and to navigate the complicated system of health providers. In a more general sense, I hypothesised that elements of the interplay between woman's agency and resources would be useful determinants of health-seeking behaviour.[297,310]

This approach led me to identify 63 variables which potentially captured the results of previous intra-household negotiations about the distribution of scarce social and economic resources for the wellbeing of its members (Appendix I). Such variables are not new in their use in economics or public health,[311] but their inclusion in a latent model with other measures of socio-economic position was innovative. Several

variables that reflected the engagement and interaction of the household with wider governmental institutions (education, social workers) were identified as they captured the extent of the household to obtain and utilise information on resources that were available to households living below the poverty line. Exploratory and confirmatory factor analysis (EFA, CFA) was conducted to investigate the measurement structure and determine the composition of the latent socio-economic position variables. Latent variables were constructed in MPLUS 7.11 using the Weighted Least Squares, Mean and Variance adjusted (WLSMV) estimator. The latent variables were measured in the sample of women who had a birth in the five-year period prior to the survey. Factor loadings of each observed variable represent the association between this indicator and the underlying construct. Model fit was assessed with the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI) and the Root Mean Square Error of Approximation (RMSEA).

Full information maximum likelihood (FIML) method was used to deal with missing data in the construction of latent variables. The extent of missingness in observed variables from which the four latent continuous variables were constructed was minimal (no missing data for observed variables for dwelling quality and economic resourcefulness, <5% in any variable in socio-cultural resourcefulness and <0.5% in any variable in woman's status). EFA identified four latent constructs. In confirmatory factor analysis, the latent measurement models for all four constructs had an acceptable fit to the data; the RMSEA level was ≤0.05 and the CFI/TFI ≥0.963, as shown in Table 7.10.

Table 7.10 Goodness of fit measures for four latent variables

Latent variable	CFI	TLI	RMSEA
Socio-cultural resourcefulness	0.986	0.971	0.024
Economic resourcefulness	0.974	0.963	0.020
Dwelling quality	0.990	0.970	0.023
Woman's status	0.995	0.992	0.032

CFI: Comparative Fit Index. TLI: Tucker Lewis Index. RMSEA: Root Mean Square Error of Approximation.

Firstly, I identified a latent measure of socio-cultural resourcefulness, which was constructed from seven observed variables (Table 7.11). These included four traditional variables (woman's years of education, woman's literacy level, male head of household years of education, collapsed version of male head of household occupational category) and three innovative indicators (school enrolment of school-age children, possession of identity documents by members of the household and proportion of all adult member of the household who had ever attended school).

Table 7.11 Latent variable of socio-cultural resourcefulness, in a sample of women who gave birth in 5 years preceding survey

Component variables	Distribution	Standardised factor loading (SE)
Woman: Years of education		
Mean (95% CI)	2.50 (2.15-2.84)	0.706 (0.035)
Woman: Literacy		
Illiterate (column %)	70.7	0.745 (0.034)
Reads/writes with difficulty	8.1	
Reads/writes easily	20.9	
Missing	0.3	
Male head of household: Years of education*		
Mean (95% CI)	4.92 (4.55-5.29)	0.670 (0.043)
Male head of household: Occupational category		
Not in employment /no male head of household (column %)	10.9	0.253 (0.032)
Manual or Agricultural worker	73.5	
Higher (Sales, Clerical, Professional)	15.6	
School enrolment of children 7-18 years old (binary)		
All children ages 7-18 enrolled in school (%)	89.5	0.459 (0.054)
Identity documents among members of household (binary)**		
All members have identity documents (%)	68.8	0.208 (0.043)
Percentage of adult household members (18 years+) that ever attended education		
Mean (95% CI)	49.8 (46.8-52.8)	0.902 (0.037)

95%CI: 95% confidence interval SE: Standard error. svyset applied in calculation of distribution. n=2,254.
*87 households have no male head of household –coded as missing. **The type of document depended on age of individuals (birth certificate for all members and additionally, national ID card for members 16 years and older).

Secondly, the variable of rural economic resourcefulness (Table 7.12) was based on twelve variables: the ownership of four household assets (fridge, colour TV, washing machine and house/apartment), agricultural assets (access to land and ownership of five types of domestic animals), as well as two innovative indicators (possession of a ration card and fruit consumption of the youngest child of school age in the 24 hour period preceding the survey).

Table 7.12 Latent variable of rural economic resourcefulness, in a sample of women who gave birth in 5 years preceding survey

Component variables	Distribution	Standardised factor loading (SE)
Household asset ownership (binary)		
Refrigerator (%)	40.2	0.368 (0.046)
Dwelling is a house or apartment (%)	54.6	0.402 (0.036)
Colour TV (%)	42.7	0.223 (0.034)
Washing machine (%)	67.2	0.238 (0.063)
Access to means of agricultural production (binary)		
Own, co-own or rent land (%)	13.1	0.780 (0.036)
Own buffalo (%)	10.2	0.670 (0.046)
Own cows (%)	3.8	0.650 (0.060)
Own horse (%)	13.7	0.735 (0.040)
Own goat or sheep (%)	12.3	0.641 (0.044)
Own poultry (%)	50.2	0.521 (0.030)
Household consumption (binary)		
Have access to ration card (%)	56.5	0.405 (0.049)
Youngest child of school age consumed fruit in last 24 hours (%)	15.3	0.236 (0.049)

95%CI: 95% confidence interval. SE: Standard error. svyset applied in calculation of distribution. No missing data. n=2,254.

Thirdly, I identified a latent variable reflecting six observed characteristics of dwelling quality, including the type of water and electricity connection, availability of a landline telephone connection, as well as construction materials of the floor, ceiling and walls (Table 7.13).

Table 7.13 Latent variable of dwelling quality, in a sample of women who gave birth in 5 years preceding survey

Component variables	Distribution	Standardised factor loading (SE)
Dwelling utilities (binary)		
Piped water connection (%)	74.9	0.422 (0.066)
Landline phone (%)	5.9	0.197 (0.063)
Electricity from public network (%)	89.5	0.690 (0.096)
Construction materials (binary)		
Floor from cement, tile or plastic (%)	36.8	0.651 (0.063)
Ceiling from concrete or tile (%)	41.6	0.711 (0.073)
Walls from red brick (%)	74.3	0.716 (0.084)

95%CI: 95% confidence interval SE: Standard error svyset applied in calculation of distribution. No missing data. n=2,254.

Fourthly, eight observed variables describing various aspects of woman's mobility and decision-making ability reflected a construct which I termed woman's status (Table 7.14).

Table 7.14 Latent variable of woman's status, in a sample of women who gave birth in 5 years preceding survey

Component variables	Distribution	Standardised factor loading (SE)
Mobility: Leave the house		
Not allowed (column %)	2.3	0.874 (0.009)
Allowed with permission	70.2	
Allowed with notice/without permission	27.5	
Missing	-	
Mobility: Go to the market		
Not allowed (column %)	28.6	0.697 (0.021)
Allowed with permission	44.3	
Allowed with notice/without permission	27.1	
Missing	-	
Mobility: Go to hospital		
Not allowed (column %)	1.4	0.865 (0.011)
Allowed with permission	69.2	
Allowed with notice/without permission	29.4	
Missing	-	
Mobility: Visit relatives		
Not allowed (column %)	3.5	0.814 (0.013)
Allowed with permission	67.0	
Allowed with notice/without permission	29.5	
Missing	-	
Mobility: Visit neighbours		
Not allowed (column %)	10.8	0.732 (0.018)
Allowed with permission	46.4	
Allowed with notice/without permission	42.8	
Missing	-	
Mobility: Run an errand		
Not allowed (column %)	19.6	0.538 (0.028)
Allowed with permission	51.7	
Allowed with notice/without permission	28.7	
Missing	-	
Decision-making about household budget		
Someone else (column %)	1.6	0.429 (0.029)
Male head of household solely	51.9	
Female head of household or jointly	46.3	
Missing	0.2	
Decision-making about visiting friends or family		
Someone else (column %)	0.6	0.457 (0.038)
Male head of household solely	61.3	
Female head of household or jointly	37.8	
Missing	0.3	

95%CI: 95% confidence interval SE: Standard error svyset applied in calculation of distribution. n=2,254

7.3 Statistical Analysis

The four latent variables were constructed based on a sample of women who had a birth in the five-year recall period (n=2,254). However, the sample of women in analysis of maternal health-seeking consisted of 2,242 women who reported giving birth in the five years preceding the survey and who were not pregnant at the time of the survey. The exclusion of 12 women who reported being pregnant at the time of the survey related to the design of the questionnaire. Unlike on the DHS, where questions relate to health-seeking behaviour for the most recent live birth, the UECCTBS instrument asked women about their most recent pregnancy. Therefore, women who were pregnant at the time of the survey would have answered questions related to ANC for the current pregnancy but questions related to delivery care about their most recent live birth. In order to construct a sample of women whose reports of ANC and delivery health-seeking are related to the pregnancy and delivery of the same child, currently pregnant women were excluded.

Socio-cultural resourcefulness, economic resourcefulness, dwelling quality and woman's status continuous scores were exported from MPLUS and merged into the dataset based on unique identifiers of women's records. All descriptive and multivariable analyses were conducted in Stata/SE v13 (College Station, USA). The sample represents health-seeking behaviours of female heads of household and children <5 years living in 25,200 households who successfully applied to the CCT pilot (i.e., fulfilled the three eligibility criteria) and were assessed to live below the lower poverty line. In order to obtain correct estimates and standard errors, I calculated household-level weights (the inverse of the probability of being included in the sample) to adjust for the unequal probability of being selected into the sample and for non-response. The resulting sampling weights ranged from 0.614222 to 3.391019. Additionally, due to the sampling design, I considered villages to be clusters and poverty categories to be sampling strata. Therefore, the *svyset* command was used and included clusters (65 villages), strata (two poverty categories) and household sampling weights. Descriptive and multivariable analyses were preceded by *svy* or *svy,(subpop)*.[224] All sample sizes presented are weighted sample sizes.

7.3.1 Descriptive analysis

The proportions of the sample by category (for categorical variables such as age group and parity), means and standard errors (for continuous variables) were calculated. P-

values for χ^2 (for binary and categorical variables) and t-test/ANOVA (for continuous variables) tests are presented to test whether differences in the distributions/means were statistically significant between groups.

7.3.2 Multivariable regression models

Logistic regression was used to assess the association between the four latent variables and binary health-seeking outcomes, adjusting for confounding. I used the same model-building approach as described for the analysis of DHS, and included relative village and district sizes as covariates. I categorised the 65 villages and 20 district of households included in the UECCTBS into tertiles by size according to the 2006 population census figures.[312] Small villages had less than 6,500 inhabitants, medium had between 6,500 and 14,499, and large villages had more than 14,500 inhabitants. Accordingly, there were 22 small, 22 medium and 21 large villages. District (*markez*) sizes were categorised as small (<249,000), medium (250,000 to 349,000), and large (>350,000 inhabitants). There were 7 small, 7 medium and 6 large districts.

7.3.3 Average adjusted probabilities of outcome

The conceptually-driven mediation analysis presented in the DHS section attempted to partition the effects of socio-cultural capital and economic capital. The four latent variables constructed in the UECCTBS dataset were derived empirically and I therefore had no *a priori* conceptualisation of whether and how these unobserved constructs were related to one another causally. Under these circumstances mediation analysis was not appropriate. In order to interpret the associations estimated in multivariable logistic regression models, I used the Stata package *margins* to estimate the predicted probability of the health-seeking outcome under investigation when the p-value of any of the four latent socio-economic position variables in the multivariable logistic regression model of was <0.1 (marginal or strong evidence of association). The presentation of the probabilities of outcome corresponding to different values of the exposure can be used in addition to the logistic regression estimates to assess the substantive and practical significance of the findings.[313]

Two types of marginal effects can be estimated: 1) marginal effects at the means (MEMs) and 2) average marginal effects (AMEs). MEMs are computed by setting the values of covariates at their sample means and estimating the probability of the outcome (instantaneous rate of change for continuous variables such as the latent

variables in this case) as values of the exposure under investigation change. AMEs are computed for each observation and averaged across the sample.[313] I chose the latter approach for two reasons. First, it is preferred by other analysts as it is thought to represent the changes in probability of the outcome as the value of the exposure changes better.[314] This is because the alternative MEM approach may generate impossible average values in the covariates (i.e., the average woman is a 0.6 resident in Assiut). Second, it is the approach that more closely approximate the estimation of the natural indirect effect in mediation analysis (which employs counterfactual definitions after a series of Monte Carlo iterative simulations based on the observed data). The natural direct effect estimated in mediation analysis is approximated by the use of AME, rather than MEM, which would mirror the estimation of controlled direct effect in mediation. However, the marginal probabilities approach estimates the reciprocally adjusted *direct* effect of a variable under consideration, unlike mediation analysis, which estimates the total effect (sum of the direct and indirect effects) of the exposure.

The marginal effect of the independent variable on the probability of outcome depends not only on the values of the other covariates, but also on the levels of the independent variable. In other words, the effect is not assumed to be linear across all values of the exposure and a single estimate of its marginal effect may not be the most appropriate expression of the changes in the adjusted probabilities. Therefore, I estimated the adjusted probability of outcome at various observed values of the independent variable under consideration, and plotted these probabilities (and their 95% confidence intervals) using the command *marginscontplot*.[315] An example of the sequence of commands used in determining the marginal effect of increasing socio-cultural resourcefulness score on the probability of seeking regular antenatal care can be seen in the following syntax:

```
svy, subpop(if anyANC==1): logistic regularANC  sociocultural_resourcefulness
econ_resourcefulness dwelling_quality woman_status confounder1 … confounderX
margins, at(sociocultural_resourcefulness = (-1.0 (.1)1.0)) vsquish
marginscontplot sociocultural_resourcefulness, ci at 1(-1.0 (.1)1.0)
```

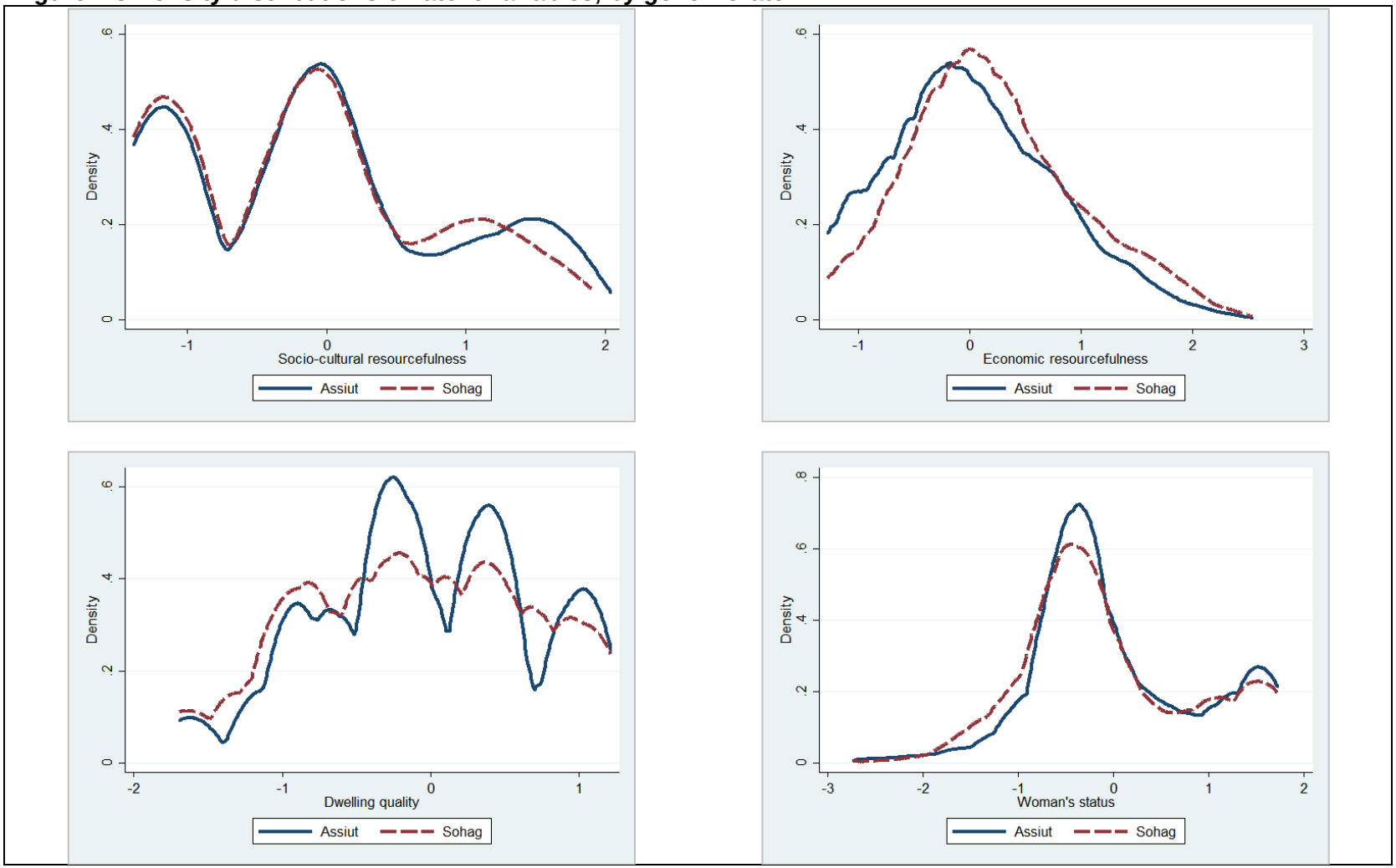
7.3.4 Descriptive analysis of latent variables

Among the 2,242 women in the analysis sample, the mean socio-cultural resourcefulness score was -0.002 (standard error [SE]: 0.042, range: -1.383 to 2.039); the higher the factor score, the higher the socio-cultural resourcefulness. The observation with a median socio-cultural resourcefulness score was characterised as

an illiterate woman with no education, with a husband in manual or agricultural occupation with five years of education, in a household where all children of school age were enrolled in school, all household members possessed identity documents and where 50% of adult members had ever attended school. The mean economic resourcefulness score was 0.057 (SE: 0.032, range: -1.276 to 2.532) and the higher the factor score, the higher the economic resourcefulness. A median economic resourcefulness score described a household which did not own a fridge or a colour TV, but owns a washing machine (automatic or semi-automatic), lived in a house or apartment which was shared with other households, had no access to land (owned, co-owned or rented), did not own any large domestic animals (buffalo, cows, horses, goats or sheep) but owned poultry, had access to a ration card and where the youngest child consumed a portion of fruit during the recall period.

The mean dwelling quality score was -0.020 (SE: 0.034, range: -1.692 to 1.213) and the higher the factor score, the higher the dwelling quality. A median dwelling quality score described a household which had a piped water connection and electricity from the public network, but no landline telephone connection, where the floor was not from cement, tile or plastic; the ceiling was not from concrete or tile; and where the walls were constructed from red brick. The mean woman's status score was 0.015 (SE: 0.032, range: -2.735 to 1.720) and the higher the factor score, the higher the woman's status. A woman with a median level of woman's status score reported being able to go to a hospital without permission, allowed to leave the house, visit relatives and run errands with permission, but not allowed to go to the market or visit neighbours, and who solely or jointly with her husband took decisions about whether to visit friends or family, but whose husband was the sole decision-maker about the household budget. The distributions of the four latent variable scores in the analysis sample are shown on Figure 7.3 by governorate.

Figure 7.3 Density distributions of latent variables, by governorate



Further, it is also important to understand whether the four latent variables were correlated and how they were distributed across the villages, districts and governorates from which the sample was drawn. The correlation matrix displayed in Table 7.15 shows the values of Spearman's rho and its p-value, assessing the null hypothesis that there is no tendency for one variable to increase or decrease as the other increases.[316] This test of correlation was chosen because some departures from normality could be seen in Figure 7.3. The only correlation between these four variables was identified between socio-cultural resourcefulness and dwelling quality, which was positive and statistically significant. This finding differs from the positive and significant correlation seen between socio-cultural capital and economic capital in the analysis of the DHS. This provides further confirmation that the two latent variables of resourcefulness capture different unobserved constructs on the UECCTBS than the two "capital" variables on the nationally representative sample.

Table 7.15 Correlation matrix of four latent variables

	Socio-cultural resourcefulness	Economic resourcefulness	Dwelling quality
Socio-cultural resourcefulness	1.0000		
Economic resourcefulness	-0.006 (0.776)	1.0000	
Dwelling quality	0.178 (<0.001)	0.003 (0.877)	1.0000
Woman's status	-0.037 (0.079)	0.032 (0.128)	-0.004 (0.858)

Spearman's rho coefficient and p-value. n=2,242.

The distribution of the four latent variables in the three geographical levels are shown in Table 7.16. Crude associations between them were examined using one-way analysis of variance, with the null hypothesis that samples from each geographic group come from populations with the same mean values. Socio-cultural resourcefulness was associated with district size; the larger the district, the higher the mean socio-cultural resourcefulness score. Economic resourcefulness was associated with all three area-level variables. The mean economic resourcefulness score was lower in smaller villages, higher in smaller districts and higher in Sohag than in Assiut. Dwelling quality score was positively associated with larger village and district sizes, but not with governorate. Woman's status was associated with village size, but no obvious pattern was seen across the three village sizes. It was also marginally associated with district size, and higher mean scores were seen by increasing district sizes.

Table 7.16 Distribution of latent variables, by area-level characteristics

			Socio-cultural resourcefulness	Economic resourcefulness	Dwelling quality	Woman's status
			Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Village size	Small (<6,500)		-0.016 (0.082)	-0.058 (0.078)	-0.105 (0.062)	0.085 (0.096)
	Medium (6,500-14,499)		-0.048 (0.078)	0.165 (0.047)	-0.070 (0.087)	-0.063 (0.075)
	Large (>14,500)		0.033 (0.084)	0.032 (0.062)	0.041 (0.054)	0.037 (0.048)
		p-value	*0.200*	*<0.001*	*<0.001*	*0.017*
District size	Small (<249,000)		-0.085 (0.065)	0.130 (0.042)	-0.080 (0.078)	-0.031 (0.046)
	Medium (250,000-349,000)		-0.028 (0.093)	0.122 (0.061)	0.031 (0.048)	0.009 (0.102)
	Large (>350,000)		0.105 (0.095)	-0.067 (0.070)	0.003 (0.077)	0.066 (0.056)
		p-value	*<0.001*	*<0.001*	*0.009*	*0.096*
Governorate	Assiut		0.018 (0.075)	-0.024 (0.050)	-0.012 (0.060)	0.019 (0.046)
	Sohag		-0.033 (0.063)	0.185 (0.045)	-0.032 (0.054)	0.008 (0.066)
		p-value	*0.216*	*<0.001*	*0.564*	*0.791*

SE: Standard error. P-value of ANOVA. n=2,242.

8 Upper Egypt: Maternal health-seeking behaviours

The first draft of this Chapter was presented at the Impact of Changing Population Dynamics on the Arab Family conference in December 2013 organised by the Doha International Family Institute in Doha, Qatar. I would like to thank the attendees at the conference session for their helpful feedback.

This Chapter was published as an article in the International Journal for Equity in Health, DOI: 10.1186/s12939-014-0111-5 (Appendix J). The content of this Chapter differs slightly from the published article. In particular, it was expanded with a figure to show the details of providers sought and the proportion of women who received the complete maternal package. Second, the interpretation of the importance of the findings in this Chapter is aided by applying adjusted probabilities. Last, the logistic regression models in this Chapter include covariates capturing the size of villages and districts, in line with the model building approach. The presence or absence of these two geographic variables does not alter the substantive interpretation of the findings. The journal peer-reviewers asked that these covariates be excluded from the adjusted models. However, I prefer to retain them in order to comment on the associations found.

8.1 Abstract

Background

Little is known about health-seeking of poor households in Egypt. This Chapter assessed the levels of maternal health-seeking behaviours in women living in poor households in rural Upper Egypt, and compared them to national averages. Secondly, it examined the association of four latent measures of socio-economic resourcefulness with four dimensions of maternal health-seeking behaviour.

Methods

A cross-sectional survey (UECCTBS) conducted in Assiut and Sohag governorates in 2010-2011 was analysed. The sample consisted of 2,242 women in households below the poverty line. The associations between four latent socio-economic constructs (socio-cultural resourcefulness, economic resourcefulness, dwelling quality, and woman's status) and receipt of any antenatal care (ANC), regular ANC (four or more visits), facility delivery and private sector delivery for women's most recent live birth in five years preceding survey were assessed using multivariable logistic regression.

Results

In the sample, 58.5% of women reported using any ANC and 51.1% facility delivery, lower than national coverage (74.2% and 72.4%, respectively). The proportion of ANC users receiving regular ANC was lower (67%) than nationally (91%). Among women delivering in facilities, 18% of women UECCTBS sample used private providers (63% nationally). In multivariable analysis, higher economic resourcefulness was associated with higher odds of receiving ANC but with lower odds of facility delivery. Socio-cultural resourcefulness was positively associated with receiving any ANC, regular ANC and facility delivery, whereas it was not associated with private delivery care. Dwelling quality was positively associated with private delivery facility use. Woman's status was not independently associated with any of the four behaviours.

Conclusions

Coverage of basic maternal health interventions and utilisation of private providers were lower among rural poor women in Upper Egypt than nationally. Variables capturing socio-cultural resourcefulness and economic resourcefulness were useful predictors of ANC and facility delivery. Further understanding of issues surrounding availability, affordability and quality of maternal health services among the poor is crucial to tackling existing inequalities in maternal health coverage in Egypt.

8.2 Introduction

Egypt witnessed large improvements in maternal health outcomes in the recent decades. Maternal mortality ratio decreased from 230 to 66 per 100,000 live births between 1990 and 2010,[164] probably as a consequence of the steadily increasing coverage of preventive and curative interventions. Between 1992 and 2008, the proportion of births covered by regular antenatal care (four or more ANC visits during the pregnancy) increased from 23% to 66%. Nationally, the percentage of births that took place in a health facility increased from 27% in 1992 to 72% in 2008.[115] However, a complex dynamic underlies these overall trends. Perceived poor quality and inconsistent services provided by the public sector has led to increasing use of private providers. This has increased out-of-pocket health expenditures, which can have a devastating impact on the precarious economic situation of the large proportion of households living near or below the poverty line.[192]

Health-seeking behaviour, representing decisions and actions to seek help from the healthcare system, one of the direct causes, is most amenable to relatively rapid change through policy interventions.[18] An analysis of the sequence of decisions is crucial to understanding decision-making mechanisms within households, many of which necessitate stark trade-offs between healthcare-related and other essential household expenditures. Analysis of a nationally-representative sample from the 2008 DHS in Chapter 5 showed that both latent variables of socio-economic position (socio-cultural capital and economic capital) were positively associated with maternal health-seeking, but that the effect of economic capital was greater.

The analysis also identified a large difference in the proportion of women who received the complete care package by area of residence. Compared to urban areas, women residing in rural Egypt were less likely to obtain ANC and to deliver in a facility. However, among women who sought these two maternal care services, rural women were twice as likely to approach private providers. The proportion of Egyptians living below the poverty line increased from 16.7% to 26.3% between 2000 and 2012/2013, with most of the increase seen in rural areas.[317] Upper Egypt is home to 25% of the country's population, but accounts for 66% of the extremely poor. Beyond this observed socio-economic gradient in health-seeking behaviours, there is a limited understanding of which additional determinants on the

individual and household-level may be associated with progression through the various dimensions of health-seeking.

8.2.1 Objectives

This Chapter contributes to the research on health inequalities in Egypt by analysing the determinants of health-seeking behaviour among poor households in Upper Egypt. Firstly, national levels of health-seeking behaviour for maternal care were compared with those reported by women living in households below the poverty line in rural Upper Egypt. Secondly, this Chapter examined the association between the four latent socio-economic position variables and maternal health-seeking behaviours in a sample of rural poor women living in Upper Egypt.

8.3 Methods

8.3.1 Study sample

The Upper Egypt CCT baseline survey (UECCTBS) was a cross-sectional study conducted between December 2010 and January 2011 in 65 of the poorest villages in Assiut and Sohag governorates. It was based on a stratified random sample selected from among 25,200 families who applied to and fulfilled the eligibility criteria for the conditional cash transfer program (children of school-age in households). The Ministry of Social Solidarity proxy means testing formula, which contains 17 components (household size and composition, dwelling characteristics, asset ownership, education and occupation status, consumption of utilities and geographic location), was used to include households living below the poverty line. The sample in this analysis consisted of 2,242 women who reported giving birth in the five years preceding the survey and who were not pregnant at the time of the survey. Comparisons with health-seeking behaviours among various groups of women captured on the 2008 Egypt Demographic and Health Survey (DHS) were conducted. The three samples derived from the DHS include: all women (nationally representative sample), women living in Upper Egypt governorates, and women in the poorest DHS wealth quintile living in Upper Egypt.

8.3.2 Exposures

Four continuous latent variables constructed in the previous Chapter (socio-cultural resourcefulness, economic resourcefulness, dwelling quality and woman's status) were used as the main independent variables of interest.

8.3.3 Outcomes

Maternal health-seeking behaviour dimensions

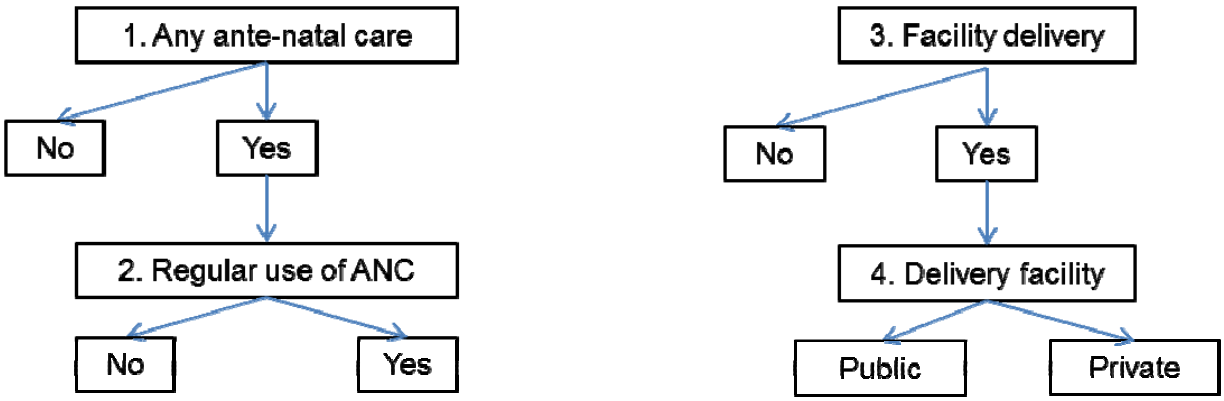
Appendix K shows the questions women were asked about their maternal health-seeking. Four binary health-seeking variables were constructed and analysed in multivariable logistic regression. Two dimensions of ANC health-seeking behaviour for the most recent completed pregnancy in the recall period were assessed (Figure 8.1). First, a binary variable constructed on the basis of women's responses to Q504 indicated whether the woman received any ANC during the pregnancy or not. If ANC was utilised, a second binary variable described whether regular ANC care, consisting of four or more visits during pregnancy, was received or not (Q507). Women were also asked for the month of pregnancy during which they sought first ANC visit (Q505). However, due to issues in the coding of the responses, a variable capturing timeliness of ANC (first ANC visit in the first trimester) was not constructed or analysed as a health-seeking dimension. Two health-seeking behaviour outcomes described women's delivery care health-seeking (Figure 8.1). A binary variable based on responses to Q509 captured whether or not the most recent delivery in the five-year recall period occurred in a health facility or not. Women missing a delivery location were considered not to have delivered in a health facility. Among the subset of women with facility deliveries, the type of facility was analysed. A binary variable captured whether the sector of the delivery care provider was public (urban hospital, urban health unit, and center for care for mothers and children) or private (private hospitals/clinics, private doctor's offices and other private medical facilities). Details about the qualifications and skill level of the delivery attendant were not collected, and therefore skilled birth attendant is not assessed.

Complete maternal care package

Descriptive analysis of a combination of elements of health-seeking was conducted. I defined complete maternal care package as the receipt of regular facility-based ANC (four or more ANC visits during pregnancy) and facility delivery. Women who

did not receive both care elements were considered not to have received the complete package. This binary classification was made regardless of whether such care was obtained from public or private providers. Women who reported receiving ANC but for whom the number of ANC visits was missing were considered not to have received regular ANC. This definition of the complete maternal care package differed from the definition used in the DHS analysis in that it did not include a component of timeliness of ANC.

Figure 8.1 Dimensions of health-seeking behaviour for maternal care



8.3.4 Confounders

A priori confounders of the association between socio-economic position and maternal health-seeking behaviours were identified from published literature.[57,318] These included woman's age group (18-24, 25-29, 30-34, 35-39 and 40 and older) and the number of children (<18 years old) residing in the household as a proxy for parity, which was not collected on the survey. In addition, elements of access, availability and acceptability of health services were captured by the relative size of villages (small: less than 6,500 inhabitants, medium: 6,500 to 14,499 and large: >14,500) and of the district (*markez*) (small: <249,000; medium: 250,000 to 349,000 and large: >350,000 inhabitants) according to the 2006 population census figures.[312] ANC utilisation was considered an *a priori* confounder in analyses of delivery care, capturing exposure to pregnancy-related health services and information. The position of the woman within her household was thought to be reflected in the latent variable 'woman's status'. Therefore, other variables describing women's relationships to other household members were not included in multivariable models to avoid overadjusting. Categories with the highest number of observations were chosen as a reference in multivariable analysis.

8.3.5 Statistical Analysis

Multivariable logistic regression was used to assess the association between the continuous latent variables identified and maternal health-seeking behaviours, adjusted for confounders. Complex survey sampling was accounted for by using the *svyset* command in Stata/SEv.13. The extent of missing data in the outcome variables was minimal and complete case analysis was used. Additional analysis using the *margins* command was conducted in cases where the p-value of a socio-economic position variable in the multivariable logistic regression model was <0.1 (marginal and strong evidence of association). The adjusted marginal effect of the socio-economic position variable was expressed as the probability of the outcome and absolute difference in the probabilities of outcome at various values of a given socio-economic position variable.[313]

8.4 Results

8.4.1 Descriptive characteristics

The demographic and socio-economic characteristics of the sample of 2,242 women analysed in this Chapter are shown in Table 8.1. Three-fifths of the women in the sample lived in Assiut governorate and the remaining 40% in Sohag. Nearly 80% of the women lived in households with 3-6 children under the age of 18 years.

Levels of maternal health-seeking behaviour

Health-seeking behaviour variables, extent of missing data and analysis sample sizes are presented in Table 8.2. Among all women, 58.5% reported receiving any ANC and among ANC users, 66.9% received regular ANC. 51.5% of births occurred in a health facility, and 17.7% of these facility births were reported in a private sector facility. Figure 8.2 shows the proportions of all women in the sample accessing any ANC, regular ANC and facility-based delivery, whereas Figure 8.3 shows the accumulated proportion of all women receiving the components of the complete maternal care package. This analysis showed that less than a quarter of the women (22.5%) received regular ANC and delivered in a health facility. The six possible combinations of maternal health-seeking behaviours are displayed in Figure 8.4. Among the 1,735 women (77.5% of the overall sample) who did not receive the complete package of maternal care, approximately one third (31.4%) did not receive any maternal care. A further 31.8% of these women received some (irregular or

regular) ANC, but delivered at home. The remaining women delivered in a facility but received no (22.1%) or only irregular (14.7%) ANC.

Figure 8.5 compares health-seeking behaviours between four samples: the nationally representative DHS sample (as presented in Chapter 5), DHS sub-sample of women living in Upper Egypt, DHS sub-sample of women in the lowest DHS wealth quintile living in Upper Egypt, and the UECCTBS sample. The utilisation of both ANC and facility delivery care on the UECCTBS was lower than national levels, but higher than in the lowest DHS quintile in Upper Egypt. Figure 8.6 summarises the four maternal health-seeking behaviours under examination in the UECCTBS sample and for comparison, in the nationally representative sample on the DHS. While the proportion of women receiving any ANC was lower on the UECCTBS, the proportion of ANC users receiving regular ANC was comparable between the two samples (91% nationally and 86% in Upper Egypt). In the national sample, 72.4% of women with a birth in the recall period reported delivering in a health facility, 63% of them having used a private provider. In the UECCTBS sample, slightly more than half of women reported delivering in a health facility, but only 17.7% of these facility deliveries took place in the private sector. Nearly half of deliveries in the UECCTBS sample (48.9%) occurred in domestic environments.

The specific types of delivery care providers that were used by women in the UECCTBS sample is displayed in Figure 8.7. Four different sub-samples of facility delivery care are compared in this figure according to their use of ANC (no ANC, irregular ANC, regular ANC) and overall (all facility delivery users). Among all users of facility delivery care, 82.3% reported using public providers. The majority of users of public facilities delivered in a public hospital; users of urban health units and centers for care for mothers and children accounted for 1.4% of the total. Slightly more than a half of all private delivery care users reported giving birth in a private hospital/clinic and the remainder used a private doctor. Among facility delivery users, women who received no or irregular ANC were slightly more likely to have delivered in public sector facilities than women who received regular ANC.

8.4.2 Determinants of maternal health-seeking behaviour

Any ANC use

The adjusted analysis of determinants of ANC use showed that both socio-cultural resourcefulness and economic resourcefulness were positively associated with the odds of seeking any ANC (Table 8.3). A one unit increase in socio-cultural resourcefulness was independently associated with a 16% increase in the odds of ANC (95%CI 1.02-1.31) and a one unit increase in economic resourcefulness was associated with a 29% increase in the odds of ANC (95%CI: 1.11-1.50). Women's status or dwelling quality scores were not associated with receiving ANC. Women in the oldest age group (40 years and above) had significantly lower odds (OR=0.66, 95%CI: 0.49-0.87) of receiving ANC compared to women in the reference group (35-39 years). The governorate of residence, size of the village or the size of the district were not significantly associated with odds of receiving ANC.

Regular ANC use

Women who reported receiving any ANC care comprised the sample for analysis of regular ANC use determinants. In adjusted analysis, socio-cultural resourcefulness was positively associated with the odds of receiving regular ANC. A one unit increase in socio-cultural resourcefulness was associated with 18% higher odds of regular use of ANC (95%CI: 1.01-1.37). None of the remaining latent variables, demographic or geographic variables were associated with receiving regular ANC.

Facility delivery

Economic resourcefulness was negatively associated with facility delivery care; a one unit increase in economic resourcefulness was associated with 17% lower odds of delivering in a facility (95%CI: 0.72-0.96). On the other hand, socio-cultural resourcefulness was marginally positively associated with facility delivery (OR=1.12, p=0.073). Neither dwelling quality nor women's status scores were associated with facility delivery. Women in the oldest age group had 49% higher odds (95%CI: 1.14-1.95) of delivering in a health facility compared to women in the reference group. Women living in households with fewer than five children were more likely than those living in households with 5-6 children to deliver in a health facility. Women who reported receiving ANC had nearly double the odds of delivering in a health facility. While the size of the village was not associated with facility delivery, women residing in medium and small districts were less likely to deliver in a health facility compared to women in large districts.

Private delivery facility use

Among the sample of women who reported delivering in a facility, neither socio-cultural nor economic resourcefulness scores were associated with the use of private delivery facility. On the other hand, a one unit increase in dwelling quality score was associated with a 52% increase in the odds of private facility use (95%CI: 1.12-2.07). Women's status, age group or the number of children in household were not associated with private facility use. Residence in Sohag governorate was associated with a more than two-fold increase in the odds of private delivery facility use (95%CI: 1.19-4.91) compared to Assiut. However, the relative size of the village or the district of residence was not significantly associated with private delivery. Women who received any ANC had 1.79 higher odds (95%CI: 1.12-2.85) of using private delivery facilities compared to women who did not.

8.4.3 Marginal effects of resourcefulness variables

Marginal effects were calculated to appraise the importance of significant ($p<0.05$) and marginal ($p<0.1$) associations identified in the previous analysis. Figure 8.8 shows three graphs related to the logistic regression models estimating ANC use and regular ANC use. Plots A and B show the average adjusted probabilities of seeking any ANC. The increase in socio-cultural resourcefulness score from -1.0 to +1.0 resulted in an adjusted increase in the probability of seeking any ANC from 55.2% to 62.0%. The same two-unit increase in economic resourcefulness was associated with an increase in the probability of any ANC from 52.1% to 64.0%. Among ANC users, the two-unit increase in socio-cultural resourcefulness resulted in an increase in the probability of regular ANC from 63.1% to 70.3%. Marginal effects of variables on the probabilities of the two delivery care outcomes are shown in Figure 8.9. An increase in socio-cultural resourcefulness score from -1.0 to +1.0 resulted in an increase in the probability of delivering in a facility from 48.4% to 53.7%. However, the equivalent two-unit increase in economic resourcefulness was associated with a decrease in facility delivery from 55.6% to 47.1%. Among women who delivered in a facility, a two-unit increase in dwelling quality score resulted in an increase of private delivery from 12.0% to 23.2%.

8.5 Discussion

This Chapter provided insights into the levels and determinants of maternal health-seeking behaviours among a sample of rural households living below the national poverty line. The four latent variables (socio-cultural resourcefulness, economic resourcefulness, dwelling quality, and woman's status) described the individual and household-level factors that were hypothesised to be associated with the process of health-seeking for pregnancy-related and delivery care.[11] Levels of both ANC and facility delivery utilisation this sample were lower than the national average (DHS 2008), but higher than those reported by the poorest DHS wealth quintile residing in the Upper Egypt region. A substantially larger percentage of ANC users on the UECCTBS did not receive the recommended four or more visits than on the nationally-representative DHS sample (33.1% and 9.4%, respectively). Only one in five women in the UECCTBS sample received the complete maternal care package consisting of four or more ANC visits and facility delivery.

The character of ANC is largely preventive and conducted on an outpatient/clinic basis, while facility delivery care is inpatient, intensive and potentially invasive. Differences in perceptions of the need for ANC and facility delivery may help explain the fact that on the UECCTBS, increasing economic resourcefulness was associated with higher odds of receiving ANC, but that it was associated with lower odds of facility delivery. Socio-cultural resourcefulness was positively associated with receiving any ANC, regular ANC, and facility delivery. Women from households with higher dwelling quality scores were more likely to deliver in a private facility, possibly capturing the more urbanised character of locations that are attractive to private health providers and greater availability or proximity of such services. The importance of women's contact with health services is exemplified in the strong association between receiving ANC and the odds of facility delivery. However, the content and quality of the interaction between the pregnant woman and the health professional and resulting expectations from health providers needs to be better understood in light of the result that receipt of any ANC also predicted private provider use among women who delivered in a facility.

Woman's status score, encompassing mobility and decision-making, appeared to matter less in the processes of maternal health-seeking than socio-cultural and economic resources. This finding is supported by a small (n=189) study conducted in 2007 in Giza, which found that women's freedom of movement and decision-

making in daily life were not significant predictors of women's use of regular ANC and delivery with a skilled birth attendant.[319] While the latent variable capturing woman's status was not constructed equivalently to the above study, the similar findings are perhaps because motherhood is a more 'traditional' empowerment resource that is governed by different cultural rules and norms than those that indicate development markers of women's autonomy or empowerment.[320] Such interpretation is supported by a recent qualitative study in an Assiut village which found that mothers-in-law did not appear to have substantial influence over women's health-seeking decisions.[321]

Strengths and Limitations

Study type and participants

This analysis was conducted on a sample of poor households residing in Upper Egypt which applied to a conditional cash transfer program and fulfilled its eligibility criteria. The levels and determinants of maternal health-seeking cannot be interpreted as being representative of all Assiut and Sohag households living below the poverty line. The sample was unlikely to have captured the most marginalised and vulnerable households – in fact, a lower coverage of ANC and facility delivery care was received by the poorest quintile of Upper Egypt households on the DHS than among women on the UECCTBS sample. However, the households captured in this dataset were potentially the type of households that would be more likely to take advantage of programmes designed to improve coverage of essential maternal and child health care.

The overall UECCTBS response rate was high (97.1%). This analysis faced several limitations. The cross-sectional and observational design of this Chapter limited my ability to assess causal relationships between socio-economic position and health-seeking behaviours. In addition, data were collected before the socio-political situation in Egypt underwent dramatic changes starting in early 2011. While the ongoing developments may have influenced the patterns of both supply and demand for maternal care,[322] the results of this analysis can be used in the future in conjunction with updated data to explicate the effect of these events on the coverage and socio-economic determinants of maternal care.

Measurement of exposures

The four latent socio-economic position measures constructed and used in this analysis relied on observed self-reported variables, which are simple to collect and

process. Despite the fact that respondents received assurances that this survey would not be used for the purposes of determining households' CCT eligibility, this context for data collection may have led to asset under-reporting. On the other hand, the presence of the enumerator in the household during this survey would have reduced misreporting of assets that the enumerator could see in the dwelling.

Measurement of outcomes

All measures of health-seeking behaviour analysed in this Chapter were self-reported. The reliability and validity of women's report of the occurrence of a live birth in the recall period is expected to be acceptable; discrepancies in time since last birth would have been identified during data collection of children's health. However, the data on health-seeking behaviour may be impacted by measurement error and recall bias. Cognizant of these possible biases in the measurement of the outcomes, I attempted to analyse simple binary measures of maternal care utilisation. It is possible that some women who reported delivering at home may have been assisted by a skilled birth attendant. On the national level, only about 1 in 10 women delivering in domestic environments report assistance by a skilled birth attendant.[323] While this information was not available on the UECCTBS dataset, it seems unlikely that the inclusion of this small proportion of home births with skilled attendance would have resulted in a substantially higher coverage of the complete maternal care package. Information on ANC provider type and price of ANC and delivery care, which would have provided further opportunities for comparison with the nationally-representative sample on the DHS, was not collected. Data assessing the timeliness dimension of ANC care was not recorded with sufficient precision and was not used in analyses. This means that the definition of a complete maternal care package in the Upper Egypt analysis differs from that applied in the DHS analysis and the levels are not directly comparable. Had timeliness of ANC been included in the definition, the proportion of women receiving the complete maternal health package in the Upper Egypt sample would be even lower than the currently estimated 22.5%.

Statistical model

The main strength of this analysis stems from the inclusion of four constructs of socio-economic position in the models predicting their association with maternal health-seeking behaviours. While I attempted to identify and include all confounders, the presence and extent of unmeasured confounding cannot be completely ruled out. There are several potential sources of unmeasured confounding. Data on

women's parity was not collected. The analysis of the 2008 DHS showed that age group was strongly associated with parity among women living in Upper Egypt.[323] Women's age group and number of children <18 years living in the household were used as proxies for parity. The latter variable was not associated with seeking ANC, but was strongly negatively associated with delivering in a facility. It is therefore possible that in addition to the effects of parity, the number of children living in the household also captured the woman's ability to be absent from the household for the duration of receiving inpatient care. Information about the receipt of information about pregnancy complications during pregnancy had been shown to be positively associated with delivery care utilisation on the DHS analysis. However, it was not collected on the UECCTBS and could thus not be included in the adjusted analysis.

Consideration of health services availability and quality

Variables capturing village size, district size and governorate of residence were included in the analysis as confounders. These area-level characteristics primarily described the extent of urbanisation, but may have also captured attitudes to maternal care-seeking and supply of health services. For instance, districts with larger populations would be expected to have a higher number and higher clinical capacity of health facilities compared to smaller districts, potentially reducing the direct and indirect costs of obtaining maternal care. However, information about the existence of health facilities does not necessary mean that such facilities are functioning and providing acceptable and good quality care. I approached the Egyptian Ministry of Health and Population with a request in 2013 to access more detailed information on health facilities (location, level, and sector) in order to describe these associations more precisely. The request was declined.

Despite these limitations, the magnitude and direction of the associations speak to the possible nature of the effects seen. One reason that women residing in smaller villages were marginally more likely to receive ANC could be that the workload of health professionals was lighter, thus enhancing their ability to provide this preventive care to pregnant women. Alternatively, the effect of small villages may be in relative ease of normalising community-wide acceptability of ANC and reducing the time and financial expenditures for seeking care. Women in larger districts were more likely to deliver in a health facility, pointing to the greater availability and accessibility of delivery facilities. Women with higher dwelling quality scores were more likely to deliver in a private facility, possibly capturing the more densely-populated character of locations that are attractive to private health providers.

Women in Sohag had higher average rural economic resourcefulness scores and were less likely to deliver in a health facility than women in Assiut. However, among facility delivery users, women from Sohag were significantly more likely to use a private provider. These findings mirror the rural-urban differentials identified on the nationally-representative DHS sample. Sohag is the more rural and poorer of the two governorates. It seems as if women in Sohag made a choice between using a private provider and delivering at home. These results highlight the importance of uncovering issues of availability, acceptability, affordability and quality of *public* facilities as providers of maternal care to women living in rural poor households and communities.

8.6 Conclusion

Socio-economically patterned inequalities in health coverage play a significant role in gaps in maternal health coverage, globally and in Egypt.[72,195,324,325] Further improvements in maternal health indicators predominantly depend on increasing this coverage among the poorest and most disadvantaged segments of society.[28,262,326] This Chapter showed that latent variables of socio-cultural resourcefulness and economic resourcefulness were useful predictors of receiving ANC and delivery care. The overall importance of these associations was expressed by marginal probabilities, and varied from a modest absolute difference of 5.3% (effect of socio-cultural resourcefulness on facility delivery) to a more substantial increase of 11.9% (effect of economic resourcefulness on seeking ANC) for a two-unit increase in the standardised scores. Unexpectedly, economic resourcefulness was negatively associated with facility delivery. This may be related to the construct of economic resourcefulness, which captures rural assets and consumption patterns. The more “rurally-rich” a household is, the more likely the woman was to deliver at home. This may reflect the importance of the woman’s continued presence to the household’s agricultural livelihood as well as cultural attitudes toward childbirth in more traditional families in general.

The levels of ANC and facility delivery utilisation were significantly lower among the Upper Egypt poor than on the nationally-representative sample. Rural poor women, such as those on the UECCTBS sample, are key to reaching universal coverage of maternal health interventions in Egypt. There is considerable scope for programs to expand the currently low proportion of women receiving the complete maternal care package. First, women who make contact with ANC providers during pregnancy

should be encouraged and supported to return for the appropriate number of follow-up ANC appointments and to deliver in a health facility. Second, programmes need to reach the sizeable proportion of women who did not receive any maternal care at all (24.3% in the Upper Egypt sample, nearly twice as high as the national level). Third, the patterns of health-seeking presented in this Chapter suggest that women may be choosing between the two types of care (ANC and facility delivery), rather than considering them complementary. Qualitative research is needed to assess whether this may the case among the 24.7% of women who received some ANC but delivered at home and among the 17.1% of women who delivered in a facility but sought no ANC during pregnancy. If such trade-offs are in fact involved in women's decisions about ANC and delivery care, it would be particularly important to understand whether they stem from considerations of affordability, and how such concerns could be addressed effectively. The analysis of the 2008 DHS showed that preference for private care among women may be driving up expenditures on care to levels that could have catastrophic consequences for poor households. While less than one in 10 women on the UECCTBS sample reported delivering in a private facility, future programmes aiming to increase the coverage of basic maternal care must ensure that any such increases are reached through the provision of good quality and affordable care.

Table 8.1 Distribution of demographic and socio-economic variables on the UECCTBS sample of women with a birth in the five-year recall period

Characteristic	Sample of women	Women with live birth	ANC users	Facility delivery users
	Sample size	*2,242*	*1,266*	*1,143*
Woman age group	18-24 (column %)	7.0	8.6	8.3
	25-29	24.3	24.1	26.8
	30-34	26.5	27.9	24.9
	35-39	26.0	26.0	23.4
	40 and above	16.2	13.4	16.6
Number of children in household	1-2 (column %)	10.5	12.8	13.7
	3-4	39.5	38.6	41.9
	5-6	39.5	39.4	35.1
	7 or more	10.5	9.2	9.3
Village size	Small (<6,500) (column %)	18.4	20.3	20.4
	Medium (6,500-14,499)	31.3	29.5	27.8
	Large (>14,500)	50.3	50.2	51.8
District size	Small (<249K) (column %)	37.2	35.8	32.2
	Medium (250K-349K)	26.8	26.1	25.2
	Large (>350K)	36.0	38.1	42.6
Governorate	Assiut (column %)	60.9	63.3	64.6
	Sohag	39.1	36.7	35.4
Socio-cultural resourcefulness	Mean	-0.002	0.075	0.076
	SE	0.042	0.052	0.052
Economic resourcefulness	Mean	0.057	0.082	-0.012
	SE	0.032	0.036	0.034
Dwelling quality	Mean	-0.020	0.007	0.012
	SE	0.034	0.035	0.037
Woman's status	Mean	0.015	-0.018	0.031
	SE	0.032	0.035	0.038

SE: Standard error. K: thousand. ANC: Antenatal care.
Complex survey design was accounted for in calculations of proportions and sample sizes reported.

Table 8.2 Maternal health-seeking behaviours for most recent birth in recall period on the UECCTBS

Health-seeking behaviour outcome	Variable type	Samples and missing data*				Distribution of outcome in analysed sample and 95% CI
		Eligible sample and recall period	Eligible sample (size)	Missing data (%)	Analysed sample (size)	
Ante-natal care (ANC)						
1. Used ANC	Binary	All women with birth 5 years prior to survey	2,242	-	2,242	58.5% (55.6 - 61.4)
2. Regular ANC (4+ visits)	Binary	All women with birth 5 years prior to survey who used any ANC	1,312	3.5	1,266	66.9% (63.6 - 70.1)
Delivery care						
3. Delivered in a health facility	Binary	All women with birth 5 years prior to survey	2,242	<0.01	2,240	51.1% (46.1 - 56.0)
4. Used private delivery facility	Binary	All women with birth 5 years prior to survey who delivered in a health facility	1,143	-	1,143	17.7% (13.1 - 23.6)

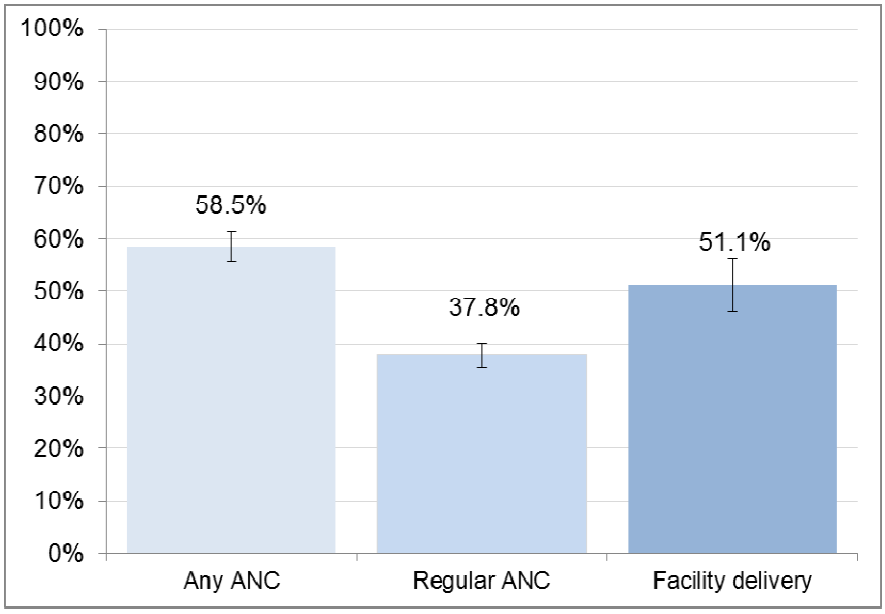
*Complex survey design was accounted for in calculations of proportions and confidence intervals. 95%CI: 95% confidence interval. ANC: Antenatal care.

Table 8.3 Multivariable analysis of determinants of maternal health-seeking behaviours on the UECCTBS

Dimension	Antenatal care				Delivery care			
	Any ANC		Regular ANC		Facility delivery		Private delivery care	
Sample size	*2,242*		*1,266*		*2,240*		*1,143*	
	OR (95% CI)	*p-value*	*OR (95% CI)*	*p-value*	*OR (95% CI)*	*p-value*	*OR (95% CI)*	*p-value*
Socio-cultural resourcefulness*	1.16 (1.02-1.31)	0.028	1.18 (1.01-1.37)	0.038	1.12 (0.98-1.26)	0.073	1.07 (0.86-1.33)	0.544
Economic resourcefulness*	1.29 (1.11-1.50)	0.003	0.98 (0.79-1.20)	0.815	0.83 (0.72-0.96)	0.016	0.92 (0.68-1.25)	0.610
Dwelling quality*	1.10 (0.96-1.25)	0.143	0.94 (0.79-1.11)	0.465	1.07 (0.93-1.24)	0.329	1.52 (1.12-2.07)	0.008
Woman's status*	0.91 (0.80-1.03)	0.195	0.97 (0.80-1.16)	0.707	1.05 (0.93-1.20)	0.430	0.96 (0.74-1.25)	0.767
Woman's age group								
18-24	1.48 (0.88-2.48)	0.136	0.66 (0.29-1.52)	0.330	0.89 (0.50-1.60)	0.692	1.44 (0.48-4.25)	0.509
25-29	0.93 (0.70-1.23)	0.603	0.85 (0.49-1.46)	0.547	1.08 (0.84-1.40)	0.527	0.51 (0.25-1.04)	0.063
30-34	1.13 (0.84-1.52)	0.430	0.88 (0.57-1.34)	0.536	0.93 (0.69-1.25)	0.617	1.22 (0.77-1.93)	0.383
35-39	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
40 and above	0.66 (0.49-0.87)	0.004	0.87 (0.53-1.41)	0.565	1.49 (1.14-1.95)	0.004	0.80 (0.47-1.37)	0.404
Number of children								
1-2	1.57 (0.88-2.48)	0.119	1.13 (0.57-2.27)	0.721	1.98 (1.32-2.96)	0.001	0.76 (0.30-1.97)	0.573
3-4	0.97 (0.70-1.23)	0.800	0.79 (0.57-1.09)	0.152	1.38 (1.12-1.69)	0.003	1.17 (0.72-1.91)	0.522
5-6	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
7 or more	0.80 (0.57-1.14)	0.210	0.83 (0.51-1.35)	0.459	1.08 (0.76-1.55)	0.661	1.05 (0.62-1.77)	0.856
Village size								
Small	1.26 (0.85-1.86)	0.244	0.87 (0.56-1.35)	0.521	1.08 (0.63-1.83)	0.770	1.79 (0.72-4.45)	0.203
Medium	0.91 (0.68-1.20)	0.494	0.84 (0.59-1.19)	0.310	0.89 (0.63-1.27)	0.525	0.82 (0.38-1.79)	0.615
Large	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
District size								
Small	0.86 (0.62-1.21)	0.384	1.23 (0.89-1.71)	0.211	0.60 (0.40-0.91)	0.017	0.98 (0.41-1.32)	0.962
Medium	0.93 (0.64-1.37)	0.723	0.82 (0.55-1.22)	0.320	0.71 (0.45-1.14)	0.156	0.66 (0.28-1.54)	0.332
Large	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
Governorate								
Assiut	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
Sohag	0.82 (0.61-1.09)	0.160	1.18 (0.82-1.70)	0.353	0.86 (0.58-1.26)	0.423	2.41 (1.19-4.91)	0.016
Received any ANC								
No					1 (ref)		1 (ref)	
Yes					1.93 (1.55-2.41)	<0.001	1.79 (1.12-2.85)	0.015

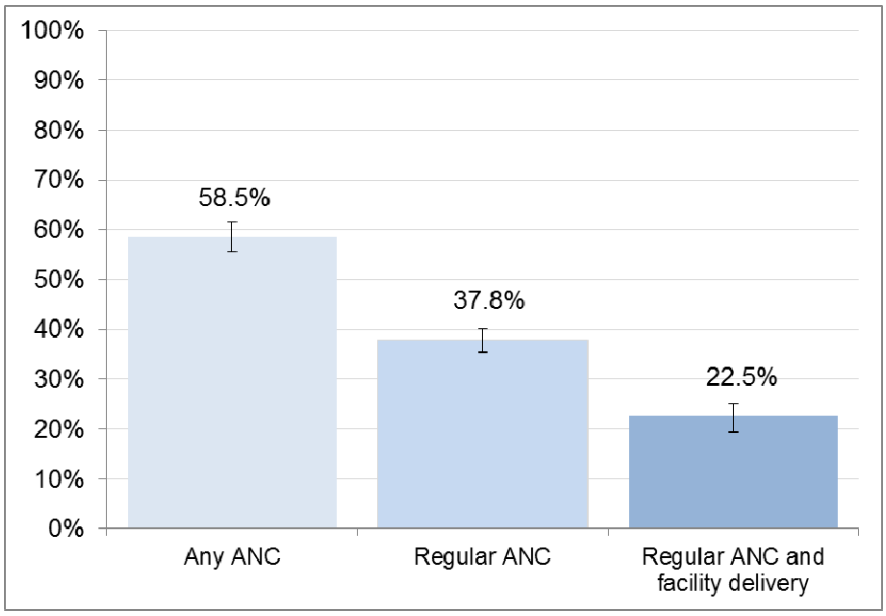
*Continuous variables; odds ratio associated with one unit increase in score. P-value of Wald test. OR: Odds ratio. 95% CI: 95% confidence interval. ANC: Antenatal care.

Figure 8.2 Levels of maternal health-seeking on the UECCTBS



Regular ANC: Receives 4 or more ANC visits during pregnancy. ANC: Antenatal care.

Figure 8.3 Accumulation of health-seeking dimensions on the UECCTBS



Regular ANC: Received 4 or more ANC visits during pregnancy. ANC: Antenatal care.

Figure 8.4 Detailed combinations of health-seeking behaviours on the UECCTBS

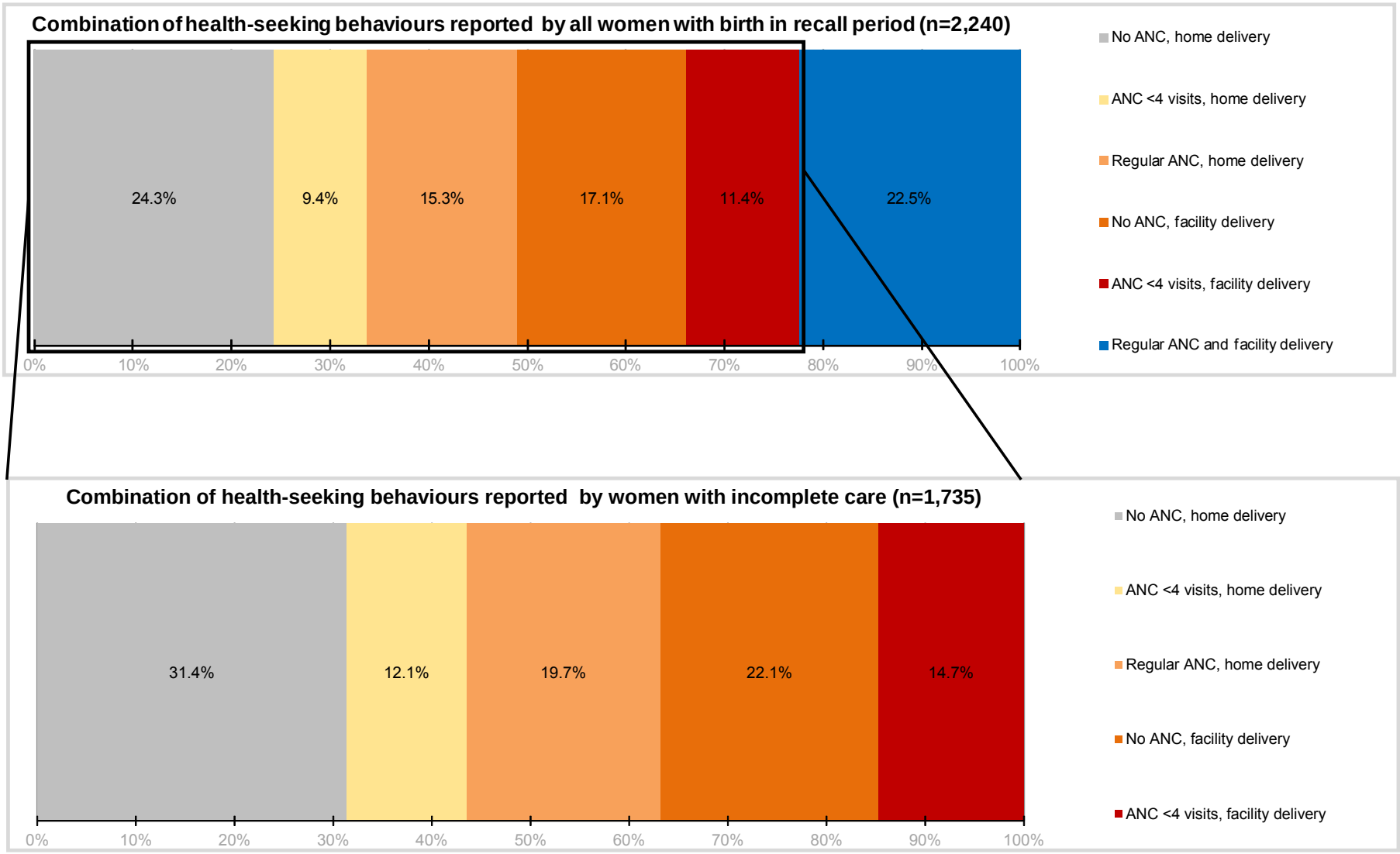
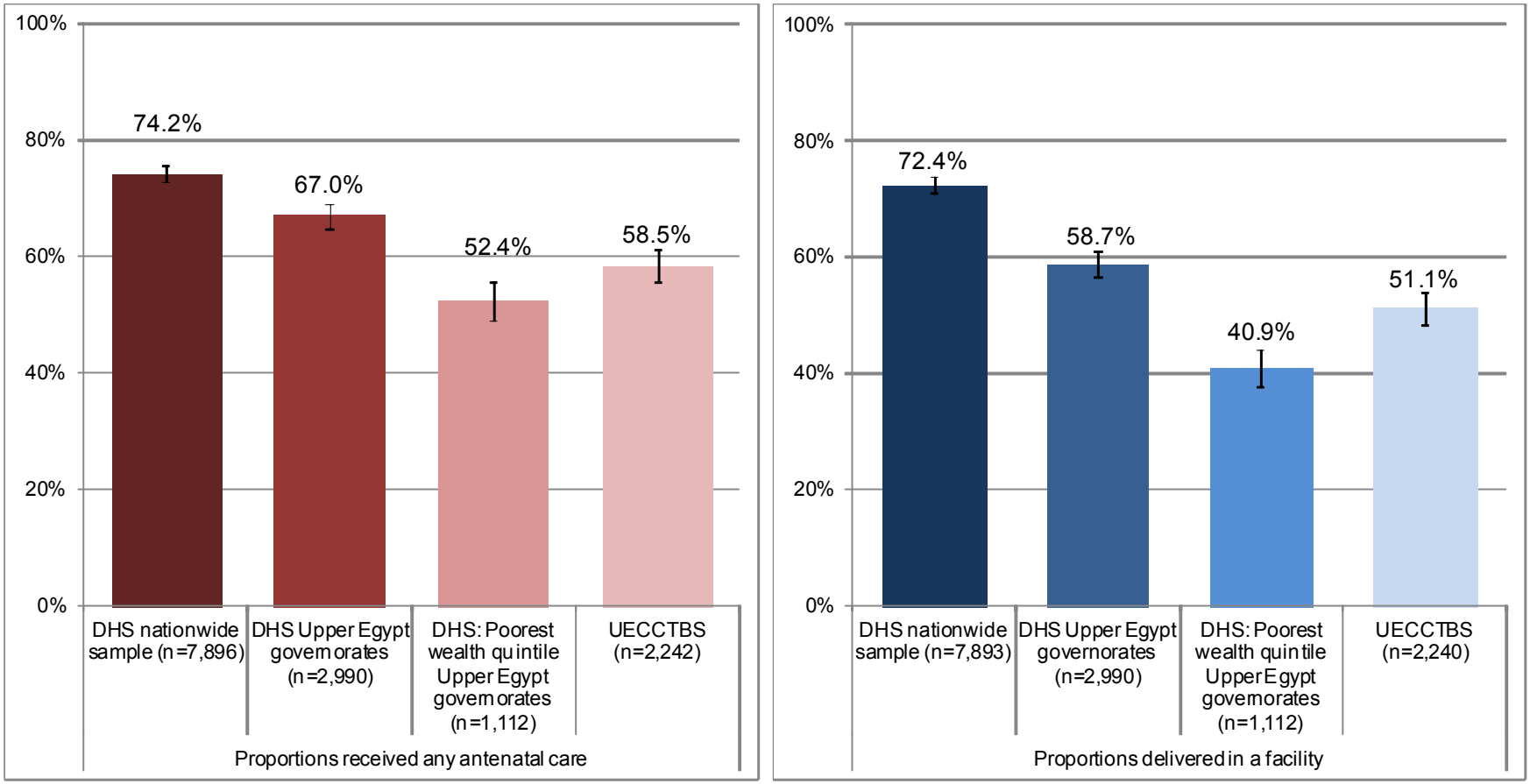
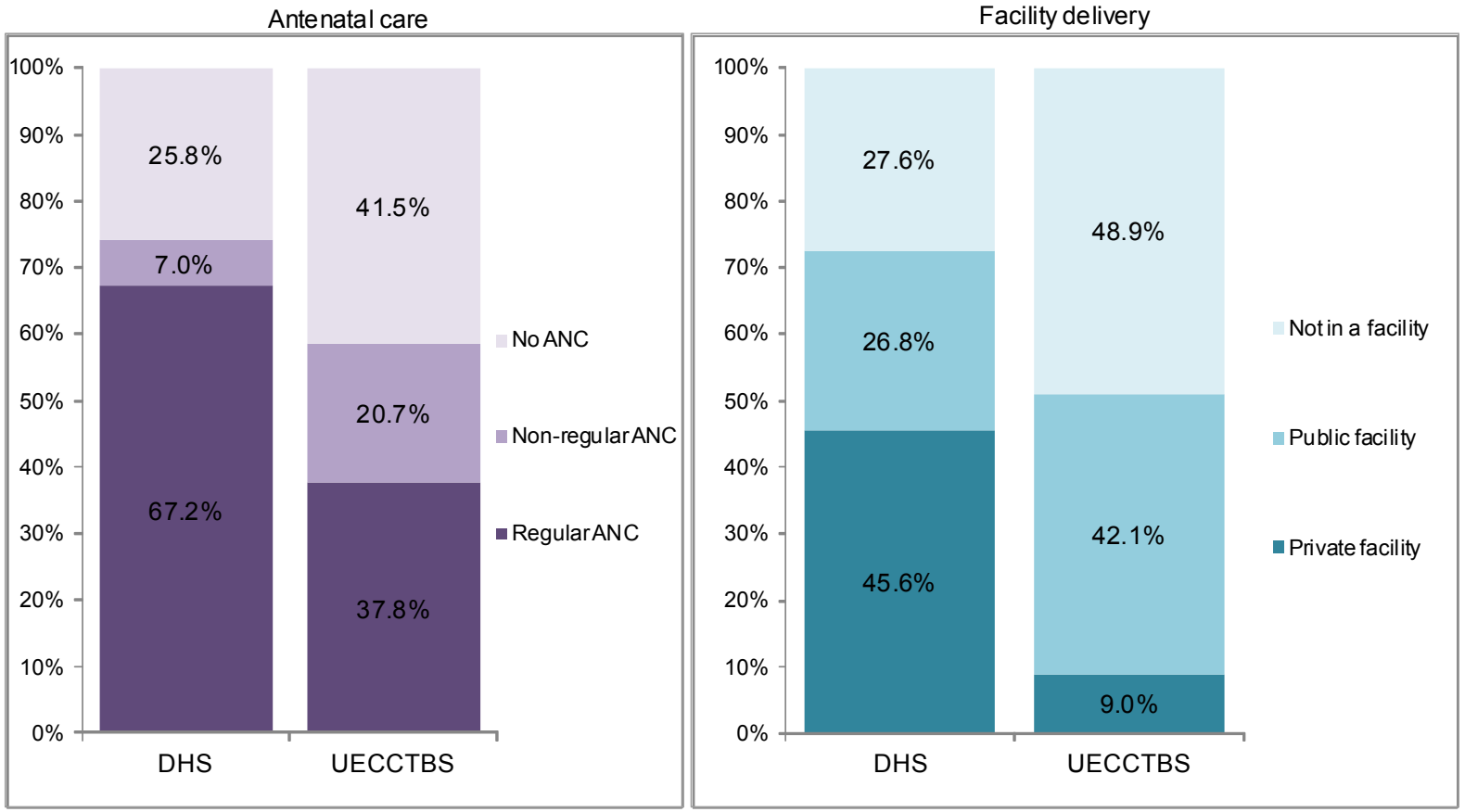


Figure 8.5 Levels of ANC utilisation and facility delivery, DHS 2008 and UECCTBS 2010/11



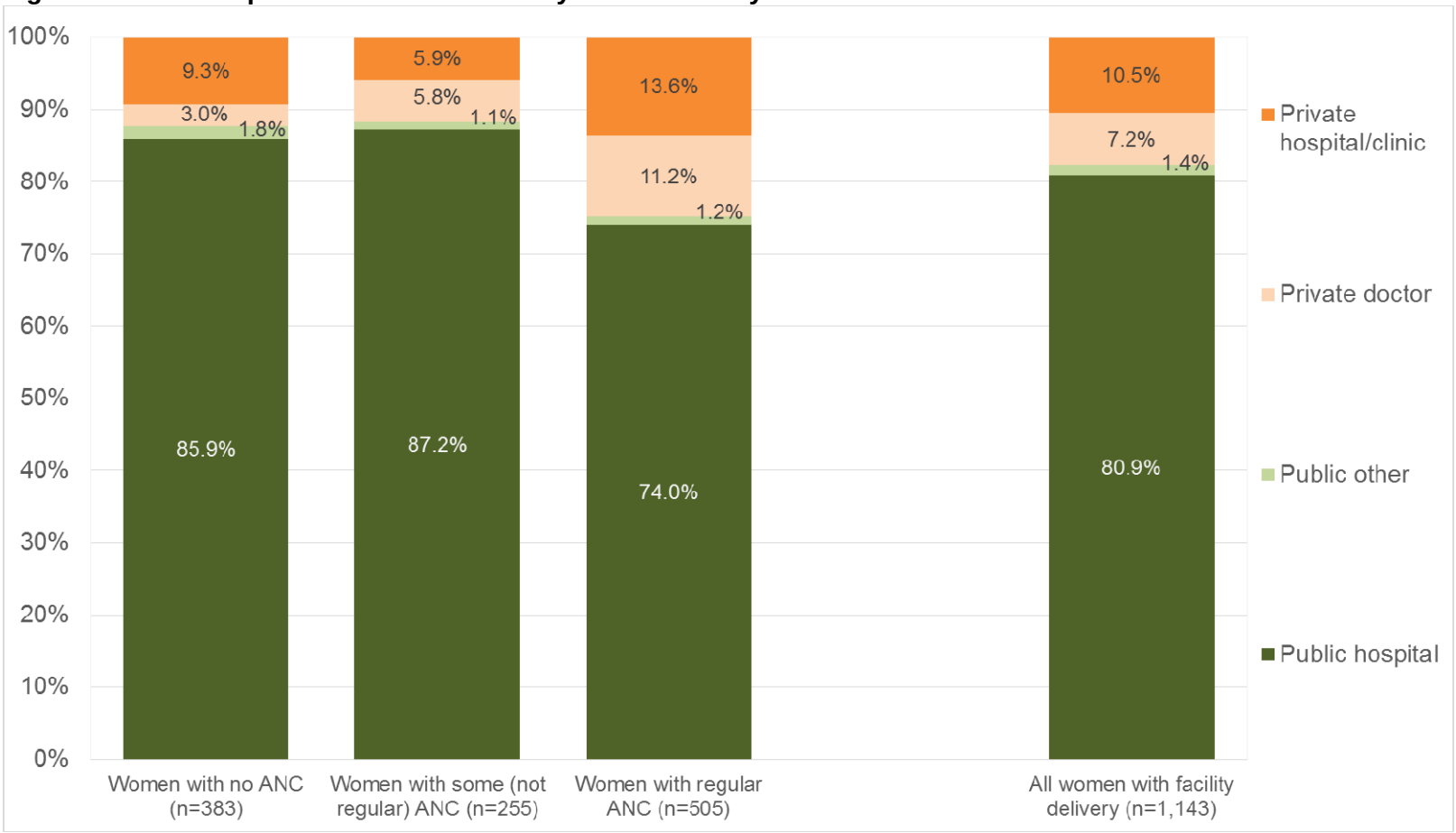
DHS - 2008 Demographic and Health Survey. UECCTBS - 2010/11 Upper Egypt CCT baseline survey. Complex survey design was accounted for in calculations of proportions and confidence intervals.

Figure 8.6 Maternal health-seeking behaviours (DHS 2008 and UECCTBS 2010/2011)



Regular ANC: Four or more ANC visits during pregnancy.
DHS – Nationally representative sample of women from the 2008 Demographic and Health Survey.
UECCTBS - Upper Egypt CCT baseline survey 2010/11.
Complex survey design was accounted for in calculations of proportions.

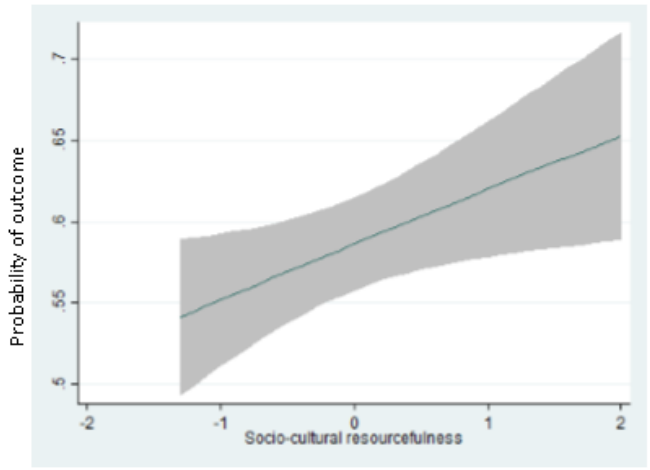
Figure 8.7 Detail of providers used for facility-based delivery care on the UECCTBS



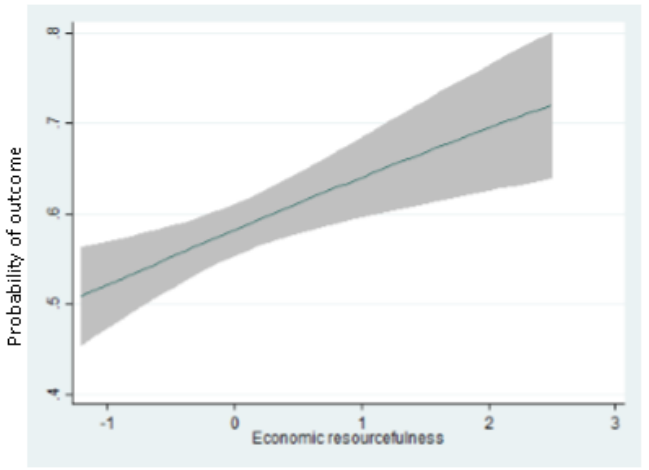
Regular ANC: Received 4 or more ANC visits during pregnancy.

Figure 8.8 Marginal effects in adjusted models for antenatal care on the UECCTBS

A. Effect of socio-cultural resourcefulness score on probability of receiving any ANC



B. Effect of economic resourcefulness score on probability of receiving any ANC



C. Effect of socio-cultural resourcefulness score on probability of receiving regular ANC

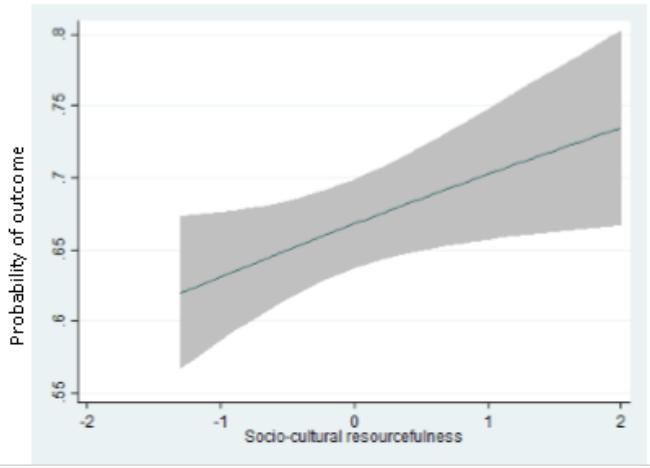
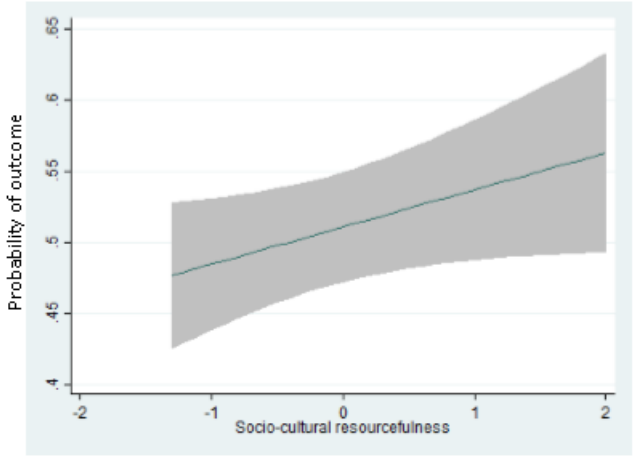
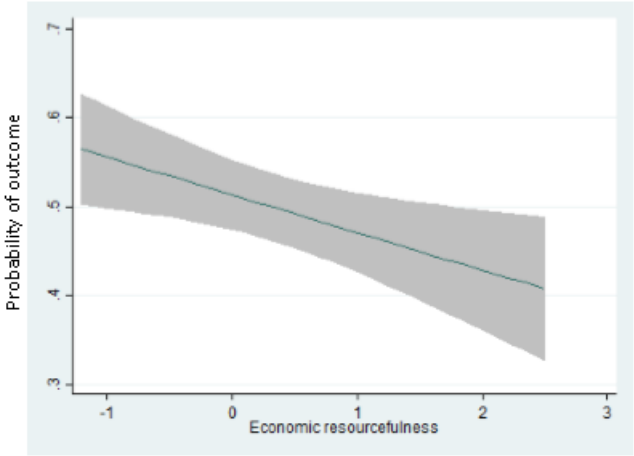


Figure 8.9 Marginal effects in adjusted models for facility delivery on the UECCTBS

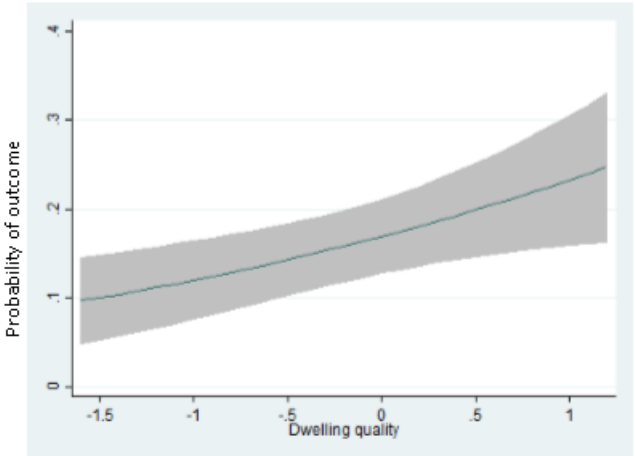
A. Effect of socio-cultural resourcefulness score on probability of delivering in a facility



B. Effect of economic resourcefulness score on probability of delivering in a facility



C. Effect of dwelling quality score on probability of delivering in a private facility



Section D. Summary and Recommendations

This thesis reviewed and expanded the understanding of the role of socio-economic position in health-seeking behaviour for maternal and child care in Egypt. The final section of this dissertation is structured into four parts. First, I summarise the findings of this thesis in light of the primary and secondary hypotheses set out in the Introduction. Second, I present recommendations for future research, primarily focusing on improving the measurement, analysis, and understanding of socio-economic inequalities in health-seeking behaviours. Third, I present brief recommendations for policy in the Egyptian context, and fourth, I conclude this dissertation with a dissemination plan and concluding remarks.

9 Summary of findings

Socio-economic inequalities in health are an important focus of global health agenda and debates. The continued patterning of ill-health and mortality along socio-economic lines rightfully concerns researchers and spurs them to try to understand this phenomenon. Despite a general acceptance of the causal relationship between low socio-economic position and poor health outcomes, much of contemporary research still focusses on quantifying the extent of these gradients, rather than on investigating the contribution of the various causal pathways to the resulting inequalities in health. Data availability is a major constraint on the latter analysis, especially in low- and middle-income countries. Yet, a more in-depth engagement with the available, primarily cross-sectional data, could bring further insights into the structure of inequalities and lead to constructive research recommendations and tentative policy guidance.

In this thesis, I focused on the socio-economic patterns in maternal and child health-seeking behaviours in Egypt. The analysis was underpinned by a conceptual understanding of the causal pathways between socio-economic position and health in general, and the healthcare access/utilisation pathway in particular. This theory-driven approach required a clear definition of health-seeking behaviour indicators and dimensions, which in most cases differed from the commonly-used MDG progress indicators. The systematic review of published evidence describing the existence and magnitude of socio-economic inequalities health-seeking behaviour in Egypt yielded very few studies, none of which used the most recent population-representative DHS survey from Egypt to conduct multivariable analyses.

I used the 2008 Egypt DHS data to identify the various dimensions of maternal and child health-seeking and their levels in the nationally-representative sample. Latent variable modelling was applied to create separate constructs of socio-economic position, namely socio-cultural capital and economic capital, which were explored as factors underlying the socio-economic gradients through multivariable mediation analysis. I estimated the levels of maternal health-seeking behaviours in the UECCTBS, a sample of women from poor households in rural Upper Egypt. Socio-cultural capital and economic capital, the socio-economic position constructs identified in the nationally-representative sample, did not apply to this rural poor sample. Socio-economic position in the rural poor was captured in four latent variables reflecting elements of resourcefulness and material wealth appropriate to the rural context (socio-cultural resourcefulness, economic resourcefulness, dwelling quality and woman's

status), and I used these variables in multivariable analysis of maternal health-seeking behaviour.

9.1.1 Substantive insights

In the DHS sample, the socio-cultural capital latent variable was considered to capture knowledge and self-efficacy, and economic capital reflected the financial resources available on the household level. In the UECCTBS sample, socio-cultural resourcefulness and economic resourcefulness captured the results of previous intra-household allocation of scarce social and economic resources for the wellbeing of its members, respectively. Dwelling quality reflected investments into the housing conditions of the household and partly also reflected the lived environment (village and district). Last, woman's status captured the extent of the female head of household's mobility and decision-making.

The primary hypotheses in this thesis posited that, in adjusted analyses:

1. Socio-economic position was positively associated with seeking any care,

2. Constructs of socio-economic position which capture knowledge and self-efficacy were associated with characteristics of health-seeking related to seeking timely care, and that

3. Constructs of socio-economic position which capture financial and material resources were associated with characteristics of health-seeking related to seeking regular care and private care.

While the latent constructs of socio-economic position differed between the two samples, to interpret the findings I consider socio-cultural capital (DHS), socio-cultural resourcefulness (UECCTBS), and woman's status (UECCTBS) to capture *knowledge and self-efficacy*. Economic capital (DHS), economic resourcefulness (UECCTBS), and dwelling quality (UECCTBS), in turn, captured *financial and material resources*. A summary of findings related to these primary hypotheses is shown in Table 9.1.

Table 9.1 Summary of findings, by hypothesis and dataset

Dataset	**Demographic and Health Survey (2008)**		**Upper Egypt CCT Baseline Survey (2010/11)**
SEP variables	Socio-cultural capital and economic capital		Socio-cultural resourcefulness (SCR), economic resourcefulness (ER), dwelling quality (DQ), and woman's status (WS)
Behaviour dimension	***Maternal***	***Child***	***Maternal***
Hypothesis 1	Total effect of socio-cultural capital on seeking any care was positive AND significant.		One or more of the four latent variables was positively associated with seeking care.
Findings	ANC: Yes AND Yes Facility delivery: Yes AND Yes	Diarrhoea: Yes AND No ARI: Yes AND No	ANC: Yes (SCR), Yes (ER), No (DQ), No (WS) Facility delivery: Yes (SCR), No (ER), No (DQ), No (WS)
Hypothesis 2	Total effect of socio-cultural capital on seeking timely care was positive AND its direct effect accounted for the majority of the total effect.		
Findings	ANC: Yes AND No	Diarrhoea: Yes AND Yes ARI: Yes AND Yes	Not available
Hypothesis 3a	Economic capital was positively associated with seeking regular care AND accounted for the majority of the total effect of socio-cultural capital.		Either economic resourcefulness or dwelling quality was positively associated with seeking regular care.
Findings	ANC: Yes AND Yes	Not relevant	ANC: No (ER), No (DQ)
Hypothesis 3b	Economic capital was positively associated with seeking private care AND accounted for the majority of the total effect of socio-cultural capital.		Either economic resourcefulness or dwelling quality was positively associated with seeking private care.
Findings	ANC: Yes AND No Facility delivery: Yes AND No	Diarrhoea: Yes AND Yes ARI: Yes AND Yes	Facility delivery: No (ER), Yes (DQ)

ANC: Antenatal care. ARI: Acute respiratory infection.

Hypothesis 1 proposed that seeking any care was positively associated with any aspect of socio-economic position. This hypothesis was considered correct if the results of mediation analysis in the DHS sample showed that the total effect of socio-cultural capital was positive and significant. In the UECCTBS analysis, this hypothesis was considered correct if seeking any care was positively and significantly associated with any of the four latent variables. The findings, summarised in Table 9.1, are equivocal. Analysis of maternal health-seeking behaviour on the DHS showed that the data were consistent with a positive total effect of socio-cultural capital on both antenatal and delivery care. However, in the analysis of health-seeking behaviour for child illness on the DHS, there was no evidence that the total effect of socio-cultural capital was significantly associated with seeking care for either illness. The findings of maternal health-seeking from the UECCTBS showed that both socio-cultural resourcefulness and economic resourcefulness were significantly positively associated with seeking any antenatal care. However, while socio-cultural resourcefulness remained marginally positively associated with seeking delivery care, I also identified a significant negative association between economic resourcefulness and this health-seeking behaviour.

Dimensions of health-seeking related to timely, regular, and private care were assessed among individuals who sought any care. In the DHS samples of maternal and child health-seeking, evidence was considered to be consistent with hypothesis 2 if the total effect of socio-cultural capital was positive AND if the direct effect of socio-cultural capital accounted for more than half of its total effect. Analysis of timeliness of antenatal care showed that although the total effect of socio-economic capital was positive and significant, the majority of this effect was indirect, that is mediated by economic capital. The total effect of socio-economic capital with timely seeking of care for both child illnesses was positive and significant, but its magnitude was small. The majority of this effect was direct, and therefore consistent with the hypothesis. It was not possible to evaluate hypothesis 2 in the UECCTBS sample because data about timing of antenatal care were not collected with sufficient precision.

Hypothesis 3a about regularity of antenatal care stipulated that, on the DHS, economic capital was positively associated with regular care AND accounted for the majority of the total effect of socio-cultural capital on this outcome. In Upper Egypt, this hypothesis was deemed correct if either economic resourcefulness or dwelling quality were positively associated with regular care. The magnitude of the association between socio-cultural capital and regular antenatal care (DHS) and socio-cultural

resourcefulness and regular antenatal care (UECCTBS) was nearly identical. However, the associations between regular antenatal care and variables capturing financial resources differed between the two samples. The data supported the hypothesis on the DHS. However, on the UECCTBS sample, neither economic resourcefulness nor dwelling quality scores were associated with seeking regular antenatal care. Instead, socio-cultural resourcefulness was significantly and positively associated with this outcome.

Last, hypothesis 3b concerning choice of private providers assessed whether, on the DHS, economic capital was positively associated with private care AND accounted for the majority of the total effect of socio-cultural capital on this outcome. In Upper Egypt, this hypothesis was correct if either economic resourcefulness or dwelling quality were positively associated with private care. The findings from the UECCTBS (association with dwelling quality) and child health-seeking on the DHS were consistent with this hypothesis. However, DHS analysis of private provider use for antenatal and delivery care showed that socio-cultural capital was significantly positively associated with choice of private care and that its effect was primarily direct (not mediated by economic capital).

Two broad conclusions can be made from this summary of findings related to the primary hypotheses. First, analyses of maternal health-seeking on both the DHS and the UECCTBS datasets showed that socio-economic position was a strong determinant of seeking any care. Constructs of socio-economic position continued to significantly predict health-seeking behaviour in the subsequent dimensions of maternal health-seeking (timely, regular and private care). However, these associations were not always related to the various constructs of socio-economic position in the manner posited by the hypotheses. Second, socio-economic position constructs were not significantly associated with seeking treatment for ill children. However, there was evidence that socio-economic position was associated with timely and private care for children, and that these associations operated consistently with the hypotheses. Next, I discuss the possible reasons for these findings using the secondary, comparative hypotheses outlined in the Introduction.

9.1.2 Comparative findings

The results of analyses from two datasets, two types of health-seeking behaviour (preventive and curative), and two types of individuals cohabiting the same households

(mothers and children) enable broader comparative interpretations of findings. The first of these secondary hypotheses related to the conceptual understanding of health-seeking behaviour. Specifically, previous research has shown that acute illnesses and conditions lead to higher levels of health-seeking compared to preventive, non-urgent states, where cues to action – perceived threats and benefits of health-seeking - are substantially lower. In this thesis, I considered antenatal care to be preventive and delivery care to be curative behaviour. For this hypothesis, based on the health belief model, to be correct, the magnitude of the association between socio-economic position and curative health-seeking ought to be smaller than between socio-economic position and preventive health-seeking behaviours. This is because actions related to curative health-seeking would be based on several other (possibly predominant) factors, causing any association with socio-economic position to be diminished. This hypothesis was evaluated by comparing between seeking any antenatal care and facility delivery care in both datasets, and broadly speaking, was supported by the results.

The DHS findings showed that three-quarters of women received any antenatal care, and a similar proportion delivered in a facility. The magnitude of the association between the two latent variables of socio-economic position and these behaviours was also very similar. However, unlike facility delivery, complete antenatal care requires several visits and a timely (first trimester) start of care-seeking. This combined outcome was received by only 57% of women (compared to 72% who delivered in a facility). More than 20% of women who did not receive the complete maternal package were women who delivered in a facility and had some antenatal care, but this antenatal care was either untimely or irregular, or both. The fact that beyond seeking any antenatal care, both timeliness and regularity were strongly associated with socio-economic position, and particularly with economic capital, implies that some consideration of trade-offs between antenatal care and delivery care might have been made by women, potentially due to cost of care and scarcity of financial resources. While this thesis did not directly assess this trade-off, it would appear that if it exists, it acts by reducing the regularity of antenatal care (number of visits during pregnancy) for the benefit of facility delivery care.

Similarly to the DHS, the proportion of women who received any antenatal care and delivered in a facility were comparable (59% and 51%, respectively) on the UECCTBS. However, only 38% of women in this sample received regular antenatal care. Timeliness of antenatal care was not used from this survey, but it is likely that the

proportion of women receiving the package of timely and regular antenatal care would be substantially lower had this element been added. The analysis of maternal health-seeking on the UECCTBS sample showed that receiving both antenatal and facility delivery care was strongly positively associated with socio-cultural resourcefulness. Additionally, socio-cultural resourcefulness carried a marginally higher magnitude and level of significance in the model predicting receipt of antenatal care compared to delivery care, and was also positively associated with regularity of antenatal care. The association of these two behaviours with economic resourcefulness is also of interest. Higher economic resourcefulness was positively and highly significantly associated with any antenatal care. However, economic resourcefulness was negatively associated with facility delivery. These results show that antenatal care, as an example of preventive health-seeking, was more socio-economically patterned than delivery care, consistently with the proposed hypothesis. However, the findings about the negative association between economic resourcefulness and facility delivery, if true, suggest a more complex and nuanced environment of decision-making about the allocation of resources between pregnancy and delivery care. It is possible that in this rural region with higher fertility levels, childbirth is considered a less risky, more natural event in the life of a woman than in more urbanised and monetised areas of Egypt. This lower perception of need for facility delivery care and inversely, the perceived threat of inadequate care, may be even lower among households that are rural-wealthy (i.e., own productive resources but not necessarily in monetary terms) and may therefore have led to this negative association with economic resourcefulness.

The second comparative hypothesis posited that the strength of the association between socio-economic position and curative health-seeking for children is smaller than between socio-economic position and curative maternal health-seeking (delivery care). This hypothesis stems from the assertion that households preferentially allocate social and economic resources to children, and was evaluated on the DHS results. As noted above, 72% of women with a birth sought facility delivery care. Among children with illness, levels of curative health-seeking were both lower (62% if those with diarrhoea) and higher (79% of those with ARI were taken for treatment) than curative maternal care-seeking. However, whereas delivering in a health facility was strongly socio-economically patterned, there was no evidence that either socio-cultural capital or economic capital predicted curative health-seeking for ill children. This initial appraisal therefore seems to confirm the hypothesis that socio-economic resources on the household level play a smaller role in the decisions to seek care for children than

for women. However, further comparisons are possible with the findings surrounding seeking of private care.

Overall, a slightly higher proportion of children for whom care was sought were taken to private providers (around 70%) than mothers who delivered in a facility (63%). Seeking private providers for both delivery and child illness care was strongly positively associated with socio-economic position. However, mediation analysis revealed a striking difference in the pattern of this association. The choice of private delivery care was largely driven by socio-cultural capital, but seeking private care for child illness was predominantly the result of economic capital. These contrasting findings may be the reason for the surprising lack of association between socio-economic position and seeking any care for child illness. In delivery care, the woman's socio-cultural capital determined whether she delivered in a private facility. This association might be a result of preferences and perceptions related to quality of care, rather than its affordability. However, there is no association between socio-economic position and curative health-seeking for children. It seems that the majority of children who were thought to be in need of care were taken for treatment, and the financial resources available to the household determined whether a public or a private sector provider was used for such care. In contrast, a woman who was unable to afford private delivery care may have elected to deliver at home rather than in a public facility.

The third and final comparative hypothesis sought to compare the levels of maternal health-seeking in the two samples. I hypothesised that due to lower absolute availability of socio-economic resources, health-seeking among rural poor households in Upper Egypt would be lower than on the DHS. Additionally, I hypothesised that due to the homogeneity of households in the UECCTBS sample, socio-cultural resourcefulness and woman's status would prove to be more important determinants of health-seeking behaviours than the availability of material resources (economic resourcefulness and dwelling quality). The comparison of levels of health-seeking leaves no doubt that the proportion of women on the UECCTBS who accessed antenatal and facility delivery care was significantly lower than nationwide. Whereas 74% of women with a birth nationally used some antenatal care, only 59% of women on the UECCTBS did. When regularity of antenatal care was taken into consideration, 67% of women nationally but only 39% of women on the UECCTBS sample sought four or more antenatal care visits. Further, 72% of women nationally delivered in health facilities, compared to 51% on the UECCTBS.

However, the largest single absolute percentage point difference between the national and UECCTBS health-seeking behaviours was in the proportion of women seeking private delivery care: 63% and 18% of those who delivered in a facility, respectively. This means that among all women with a birth, 45% on the national level but only 9% in UECCTBS used private facilities for deliveries. Additional comparisons of the public and private providers can be made for delivery care across the two samples. Nationally, the private-sector delivery care consisted largely of private doctors and private hospitals/clinics. In contrast, among women on the UECCTBS who delivered in facilities, public facility use was the norm, and consisted predominantly of hospitals. Due to the concentration of the population along the Nile River in the two Upper Egypt governorates, neither the distance nor travel time from rural areas to district cities where such public hospitals exist are large. However, despite this accessibility, the low use of lower levels of public facilities for delivery care in the UECCTBS sample is puzzling. Among women who delivered in facilities in both samples, those living in more rural areas (rural residents on DHS and Sohag residents in Upper Egypt) were twice as likely to seek private delivery providers compared to urban dwellers, a finding shown previously.[327] While more research is required, this seems to indicate that either women with risk factors/complications were more likely to seek facility delivery and to chose hospitals, or women in general preferred to deliver in hospitals, or that lower level public facilities were not operational and/or desirable to women. It is possible that several of these factors played a role in producing the observed patterns.

The answer to the second part of this hypothesis, that socio-cultural resourcefulness and woman's status were more important determinants of health-seeking behaviours on the UECCTBS than the availability of material resources, is not straightforward. Analysis of associations between the four latent variables and maternal health-seeking behaviours (seeking any antenatal care and facility delivery) showed that socio-cultural resourcefulness was positively associated with both outcomes on the UECCTBS. Economic resourcefulness was also associated with both - positively with any antenatal care but negatively with facility delivery - which complicates the interpretation of the results. Woman's status and dwelling quality were not associated with either health-seeking behaviour, and one or both may be due to chance. A further comparison of regular antenatal care showed that while economic capital was the primary determinant of antenatal care regularity on the DHS dataset, socio-cultural resourcefulness was the only socio-economic variable associated with this outcome on the UECCTBS.

It is important to reiterate that no mediation analysis was conducted on the models assessing the association of the four latent variables with health-seeking behaviour outcomes on the UECCTBS. Therefore, a formal partitioning of effects into those related to resourcefulness and those related to material resources is not available. The logistic models presented for UECCTBS showed the effect estimates of each of the latent variables *adjusted* for the effects of the other three, and may therefore obscure a situation in which the associations between these exposure variables and the outcomes, as well as among the latent variables themselves, were more complicated. On the whole, however, the findings from the UECCTBS showed that even in this homogeneous group of poor households in rural Upper Egypt, some elements (although not consistently the same elements) of socio-economic position played a role (although not consistently in same direction) in observed variations in maternal health-seeking behaviours. In the future, the complex nature of these associations could be better understood with qualitative approaches and through a more in-depth understanding of the availability, acceptability, affordability, and quality of maternal care services that exist in the villages and districts of women's homes.

Having discussed the findings in light of the three primary and three comparative hypotheses, I now briefly consider the strengths and limitations of this thesis. Both characteristics were comprehensively discussed in each analysis chapter and will therefore not be duplicated here. Rather, this summary of the main contributions and limitations of this thesis is meant to serve as a context for the subsequent discussion of recommendations.

9.1.3 Strengths and limitations

This thesis analysing socio-economic determinants of health-seeking behaviour is unique in its scope, methods, and choice of context. In terms of its scope, the systematic review showed that this is the first study in Egypt to consider the most recently available nationally-representative DHS (2008) dataset to estimate the association between socio-economic position and health-seeking behaviour for maternal and child care in multivariable analysis. This thesis considered various dimensions of behaviours, and could therefore present comparative findings, namely between maternal and child health-seeking, as well as between curative and preventive behaviours. Moreover, the inclusion of a high-quality survey from rural Upper Egypt made this the first study to analyse maternal health-seeking among a sample of households living below the national poverty line. Last, this is the first study to examine

the direct fees for maternal health-seeking (antenatal and delivery care) on a nationally representative survey in Egypt.

A recent article called for better measurement of socio-economic position and for an expanded, country-specific understanding of the relative contribution of different proximal pathways to inequalities in this outcome.[113] The methodological approach of this thesis involved an extended conceptual understanding of health-seeking behaviour as a pathway linking socio-economic position and health outcomes. In order to examine the association between socio-economic position and health-seeking behaviour, several primary and secondary hypotheses were outlined. I empirically constructed various dimensions of socio-economic position using latent variable analysis, and applied causal mediation analysis to estimate the contribution of each dimension of socio-economic position to the overall association with health-seeking. I showed that this quantitative approach can provide useful insights into the socio-economic patterning of health-seeking behaviours. In particular, it goes beyond estimating the magnitude of association between socio-economic position and health-seeking to uncover the potential reasons for the existence of such inequalities. This thesis showed that quality of care and social desirability of private providers need to be better understood in order to improve coverage of basic health interventions without catastrophic financial consequences for economically vulnerable households in Egypt.

The third contribution stems from selecting Egypt, a regional political, economic and population powerhouse, as the context for this study. Similarly to many middle-income countries in the Middle East and across the world, the utilisation of privately-provided services has been increasing in Egypt.[328-331] This trend carries important implications about the role of the state in the provision of affordable health services as a part of maintaining a basic social safety net, particularly for the significant proportion of the population living in poverty. Beyond lessons that might apply to other countries, Egypt is a good case study because health services are in close proximity to the vast majority of the population. As shown in this dissertation, the overall levels of health-seeking for maternal and child care were relatively high, yet remained socio-economically patterned. The attainment of universal coverage with basic preventive and curative care for mothers and children therefore relies on the existing gaps to be closed, and this means focusing research, policy and interventions on the needs of and characteristics of care received by the poorest segments of society.[332] This thesis examined two datasets from immediately prior to the 2011 revolution, and can therefore be seen not only as a relevant and timely input to future discussions about

the alleviation of socio-economic inequalities in health, but also as a historical record, a 'pre-revolution baseline' of sorts.

The main limitations of this thesis concern the study design, the causal interpretation of findings, and relevant features of the secondary datasets used. All analyses in this thesis, other than the systematic literature review, were based on a cross-sectional study design, used quantitative methods, and both exposures and outcomes were self-reported. The assessment of the association between socio-economic position and health-seeking behaviour attempted to mimic cause-and-effect relationships, and relied on several assumptions, the veracity of which could not always be formally tested. Primarily, the correct estimation of the associations depends on a complete adjustment for confounding in the logistic regression models. Mediation analysis for the purpose of assessing the relative contributions of the direct and indirect pathway consisted of a set of mathematical equations. Its results cannot decisively confirm or refute whether economic capital acted as a mediator in the hypothesised relationship, or test whether the associations specified in the model were indeed causal.[333] Intervention studies using experimental designs would be most appropriate design to examine these assumptions. Overall, the meaningfulness and implications of these findings for policy depend on the extent to which health-seeking behaviour is a causal pathway between socio-economic position and health outcomes of women and children in Egypt.

The interpretation of the findings of this thesis relies therefore heavily on the conceptual framework and understanding of the context in which the specific health-seeking behaviours are scrutinised. The health/access utilisation pathway thought to causally link socio-economic position and health outcomes consists also of perception of need and quality of care, in addition to health-seeking behaviours. These two important dimensions were not examined in this dissertation, but they are recognised as important elements in the understanding of socio-economic patterning of health and illness. In particular, socio-economic patterning of the perception of need for care may have introduced selection bias to the sample of women and children included in analyses of health-seeking. Differences in perception, definition, recognition, and recall of child illness along socio-economic lines are of particular concern to this thesis. Egypt has a long history of social science research about child illness and its treatment. However, the few recent studies on this topic with rigorous study methods were insufficient to comprehensively assess the potential existence and effect of such biases.

Quality of care and satisfaction with health services can form a powerful feedback loop when considering need for medical attention, as shown in Chapter 1, Figure 1.2. The assessment of the quality of care received by women and children is outside the scope and data availability of this thesis. However, evidence from both high- and middle/low-income settings showed that among women who seek maternal care, poorer women receive lower quality of care and fewer care components.[97,334] If true, such socio-economic patterns of care quality could have a direct impact on health outcomes, as well as on future perceptions of need for care, acceptability of care from various providers, and willingness to seek care.

This thesis used two high-quality datasets. However, neither of these datasets was specifically collected or powered to assess socio-economic inequalities in health-seeking behaviours. The choice to examine maternal and child health-seeking was made based on data availability; no other health-seeking behaviours were extensively covered on the two surveys. For children, only health-seeking for diarrhoea and ARI was collected; antenatal health-seeking was only assessed for the most recent birth in the recall period. Data about health-seeking behaviours for chronic illnesses, mental health issues, injuries, and data about any health-seeking of adult men were not collected. Additionally, some issues of cross-dataset comparability limited the comprehensiveness of this dissertation. Unlike the DHS sample, the UECCTBS only interviewed female heads of households about their maternal health-seeking. In addition, the differences in the collection of data on child illness made it impossible to analyse health-seeking behaviours related to child illness on the UECCTBS.

The final overarching limitation of this thesis is a result of the combination of data, choice of exposure variable (socio-economic position), and quantitative analytical methods, while facing a lack of detailed information about the supply and quality of care in Egypt. In my motivational statement, I wrote that this dissertation is “an exploration of Egyptian women’s interactions with the country’s health system.” I attempted to uncover the extent to which health-seeking behaviours differed by socio-economic background, and to the extent possible, to explicate the reasons for these associations. Despite the neutral structure of the demographic and epidemiological methods used to assess hypotheses, the answers indirectly implicate the characteristics of women and their households. The statement that “women with lower socio-cultural capital were less likely to seek antenatal care” is loaded with meaning, and can be misunderstood to place blame on the women and their characteristics for

their “poor” choices. To quote from a qualitative study of maternal care-seeking in Ghana by Kuumuori Ganle et al (italics mine):

> “Our findings highlight how a *focus on patient-side factors* can conceal the fact that many health systems and maternity healthcare facilities in low-income settings such as Ghana are still chronically under-resourced and incapable of effectively providing an acceptable minimum quality of care in the event of serious obstetric complications. Efforts to encourage continued use of maternity care services, especially skilled assistance at delivery, should focus on addressing those negative attributes of the healthcare system that *discourage access and use*.[335]

This thesis primarily focused on assessing determinants of health-seeking from the perspective of women and children who were in need of care. While such analysis can be insightful, more attention needs to be paid to issues of measurement and understanding of the characteristics of the Egyptian health system in the future. Indeed, a correct interpretation of this thesis’s findings depends greatly on such understanding. I now turn to consider some recommendations for future research that might enable such synergies.

9.2 Recommendations for research

This thesis identified the need to improve data collection of the various dimensions of health-seeking behaviour and to use these data to address current gaps in evidence. These observations were made during analysis of the secondary datasets and interpretation of results, as well as during the process of data-cleaning for the Upper Egypt CCT baseline survey.

The understanding of maternal health-seeking behaviour can be improved by several relatively simple changes to the DHS questionnaire. Firstly, there is a category error in the location of delivery, which lists “private doctor” as a response option. This response option, which was selected by a significant proportion of women with births, provides an answer about the skill level of the delivery attendant (doctor) and the sector of delivery care provision (private). However, it does not provide information about the physical location of the delivery, particularly whether this occurred in a non-facility setting, in a private clinic/hospital, or in a public facility under the *fundoky* system.

However, an analysis of the price paid for delivery care between women who delivered in “private clinics/hospitals” and “private doctors” showed that the amounts reported are significantly lower among those who chose the latter option (results not shown). It is therefore possible that the “private doctor” response option is chosen predominantly by women using public facilities under the *fundoky* system. Future DHS questionnaires fielded in Egypt should ensure that the location of delivery is captured appropriately, and possibly to also allow for a response combining a public facility location and private delivery attendant.

The second limitation of the DHS questionnaire (not specific to Egypt’s survey) pertains to the sequence of questions about antenatal care. The questions elicit multiple responses about the possible locations, attendants, number of visits, and care components. However, in cases when multiple locations of care (and particularly if both public and private sector) were used, it is not possible to ascertain which care professionals, care components, and visits related to each listed location. This system of collecting data about antenatal care is structured based on the need to produce population-level indicators of coverage. It may be possible to collect information about antenatal care health-seeking to capture the quality of care by provider, as well as patterns of health-seeking behaviour among women.

This thesis offers several recommendations for improvement of collection of data capturing health-seeking behaviour surrounding child illness. Currently, it is not possible to ascertain whether children for whom two or more illnesses were reported were ill with these symptoms at the same time during the recall period, or whether multiple illness episodes occurred. Consequently, if a child had been ill with both diarrhoea and ARI during the recall period, and help for both illnesses was sought from the same provider, it is not possible to ascertain whether these responses reflect a situation in which one illness and one provider visit occurred, or whether two illness episodes and two separate help-seeking visits were made. More generally, it would also be important to ask how many episodes of illness occurred during the recall period in total, taking into consideration illnesses which may not fit the criteria for diarrhoea or ARI. Such additional understanding or the child’s frailty during the recall period, which should also include a more extensive assessment of length of illness episode(s), would allow researchers to more fully adjust for illness severity in analysis of health-seeking behaviours.

Collection of other elements of decision-making surrounding children illness episodes would provide a richer understanding of health-seeking behaviours. As previously noted, it is important to assess whether socio-economic differences in perception of illness and illness severity contribute to the socio-economic patterning (or the lack thereof) of health-seeking behaviours. Qualitative methods of research would be most appropriate for such examination, but I propose that adding a simple question on the DHS might go a long way in exploring patterns of health seeking. For children for whom illness was reported, the respondent could be asked whether she believed that the illness required the attention of a health professional. The best location of this question in the questionnaire sequence would need to be studied further. In particular, it would be important to determine whether it should be placed before or after the respondent is asked about whether medical help was actually sought. It is possible that the addition of this question would reveal that a higher proportion of children living in households of lower socio-economic status were not taken to a health provider despite perceiving a need to do so, and/or that a higher proportion of children from wealthier households were taken to a health provider despite an absence of perceived need for care. Additionally, in order to assess the validity of respondent's report of the health-seeking episode and content of care received, it is essential that the questionnaire captures the identity of the person accompanying the child for care and treatment. At a minimum, such question should ask whether the respondent took the child for treatment or someone else. However, a more complete picture of the person or persons in charge of seeking treatment might uncover additional dimensions and patterns of intrahousehold decision-making dynamics.

It is impossible to overstate the usefulness of availability of data on costs of care collected on the 2008 DHS in relation to examining maternal health-seeking behaviour, the economic impact of health-seeking on households, and the future application of this data on assessing cost of care in relation to its quality and content. However, the collection and coding of these data could be improved in the future to improve its application to assessing effectiveness of free public care targeting. First, I noted a relatively high extent of missing data in the reporting of price paid for delivery care, in particular among women who delivered by a caesarean section. It is plausible that some women were not present during the fee payment or informed of the amount paid. A simple binary question could be added on whether care was completely free of charge or not. If the response is affirmative, the current question on how much was paid would follow.

Second, among respondents who reported receiving free care, it would be important to understand whether they were eligible for free publicly-provided care (such as antenatal care in the morning), whether they were granted free care under the “at the expenses of the state” (على نفقـــات الدولـة) scheme, or whether their fees were waived at the provider’s discretion. Third, the amount paid for children’s curative care was not collected on the Egypt DHS. When designing such questions, the issue of the number of illness episodes should be kept in mind. If a child had both diarrhoea and ARI and help was sought for both illnesses from the same provider type, the addition of a question on price of care will not suffice, unless it is clear whether care was sought (and paid for) once or more than once. Ideally, the price of consultation would be collected separately from the price of medication and laboratory tests. Such separation of expenditures by care element would allow researchers to consider whether price of care is a factor in choice of providers for treatment of child illnesses. In particular, it would be important to examine whether the use of private pharmacies is associated with lower expenditures as it eliminates the need for a medical consultation and related fees.

There are notable limitations to the assessment of care quality from population surveys relying on respondent recall. Some elements of quality and content of care are currently captured for antenatal and delivery care (e.g., the skill level of attendant, antenatal care components). However, given the importance quality of care in the conceptual feedback loop leading to future health-seeking behaviours, the usefulness and practicability of additional questions to assess the perceived quality of care should also be explored. Two opportunities present themselves at the moment. The qualitative research in Ain es-Sira as well as the expanding evidence on the high proportions of women who experience abuse and disrespect during childbirth globally [60,336] show that desirability of certain providers is based on dimensions other than the clinical aspects of care quality. As a pilot, the DHS could consider adding a brief sequence of questions eliciting the prevalence and type of such behaviour on a random sub-sample of women with a birth in the recall period. In addition, questions that capture choice of providers while allowing for multiple responses, such as antenatal care provider, are good opportunities to collect the reasons for approaching various providers. Informative type of response options might include those related to the price of care, clinical quality of care, respectful care, availability (equipment) and accessibility (location, opening hours) of care.

It is crucial to note that the reliability and validity of any additional questions would need to be fully appraised and considered. More generally, it is essential to also assess the validity of currently collected elements of health-seeking behaviour, particularly those related to respondent's ability to differentiate between provider types, recall elements of antenatal care, and report price of care. While my recommendations largely focused on measurement of health-seeking behaviour, the reliable and valid measurement of individual components used to construct socio-economic position variables is equally important, and carry implications for research of other demographic and population health issues.

As the burden of non-communicable and chronic diseases increases in Egypt, health-seeking behaviour as an area of inquiry will gain in importance for public health and policy. Health-related preferences and behaviours, and their socio-economic patterning, reflect lifelong experience with healthcare providers. A comprehensive understanding of this phenomenon will require better data (ideally from prospective cohort studies) for a greater variety of preventive and curative behaviours, such as medication adherence and attendance of follow-up visits. However, first and foremost, the understanding of health-seeking in Egypt necessitates more information about the structure, availability, capacity, and quality of care provided by the health system.

9.3 Recommendations for policy

This thesis cannot provide a complete exposition of the undoubtedly numerous issues leading to socio-economic patterning of maternal and child health-seeking in Egypt. Therefore, the extent to which it is able to recommend evidence-based policy action is limited. Instead, I focus here on considerations that need to be made before any such interventions are designed and implemented, by highlighting three key findings that could help guide policy priorities in Egypt.

First, maternal care (and most likely also treatment of child illness) is expensive. The average price paid for publicly provided complete maternal care package is 72 EGP (4 ANC visits and normal delivery), rising to 211 EGP in case of delivery by caesarean section. Such expenditures constituted at least 40% and 114% of the monthly per capita consumption expenditure for persons living below the lower poverty line (quarter of Egypt's population and half of Upper Egypt's population). The expenditure for publicly-provided complete maternal care package with a caesarean section was catastrophic even for persons living on the upper poverty line, where it accounted for

more than 90% of the monthly consumption expenditure of 233 EGP per capita in 2008/9. Despite the existence of free public care, such care was not targeted effectively to the most socio-economically vulnerable women, and private care was five to ten times more expensive than private care.

Second, the overall levels of health-seeking for maternal and child care are high. Issues related to price of care, perception of need and quality of care may be preventing Egypt from reaching universal coverage of these basic interventions. Trade-offs in utilisation of care between preventive and curative care, and between maternal and child care, may be occurring, particularly in households of lower socio-economic position. There is a clear need to increase the retention of women in care throughout pregnancy in order to receive the complete maternal care package. This can be achieved by increasing the number of antenatal care visits and ensuring women deliver in facilities or with a skilled birth attendant. In particular, the high utilisation of antenatal care can be a basis of provision of free public antenatal and delivery care to women who might not be able to afford such expenditure.

Third, this thesis only assessed the issues of quality of care tangentially. However, the high and increasing use of private care in Egypt is a warning sign that the accessibility, acceptability and/or quality of publicly provided maternal and child care might be suboptimal. However, due to the extensive dual public-private practice of Egypt's physicians, some these issues may also be present in privately provided care.

These three issues are closely linked. The high price of care and inefficient targeting of free care can lead to low levels of health-seeking among those with fewer resources. Poor quality of care in the public sector increases the use of private sector providers who charge higher fees for care. An armamentarium of interventions has been developed and tested to address these reinforcing negative synergies. Programmes designed to narrow socio-economic inequalities in health-seeking and health outcomes have been implemented in numerous LMICs countries. These include, for example, voucher schemes and monetary rewards for utilisation of pregnancy and delivery care,[337-339] removal of user fees,[340-343] creation of community or micro health insurance,[344,345] women's groups,[346,347] conditional cash transfers,[348-350] birth preparedness planning,[351] social franchising,[352,353] mobile banking and savings schemes,[354] provider reimbursement,[355,356] and provider accreditation.[357] Yet, the impact of these interventions on improving health outcomes and health equity has been equivocal, and appears to depend greatly on its

appropriateness for the chosen context and intensity of implementation.[358-360] Regardless of the choice of intervention, the importance of a robust impact evaluation cannot be overestimated.

9.4 Dissemination plans and conclusion

9.4.1 Dissemination

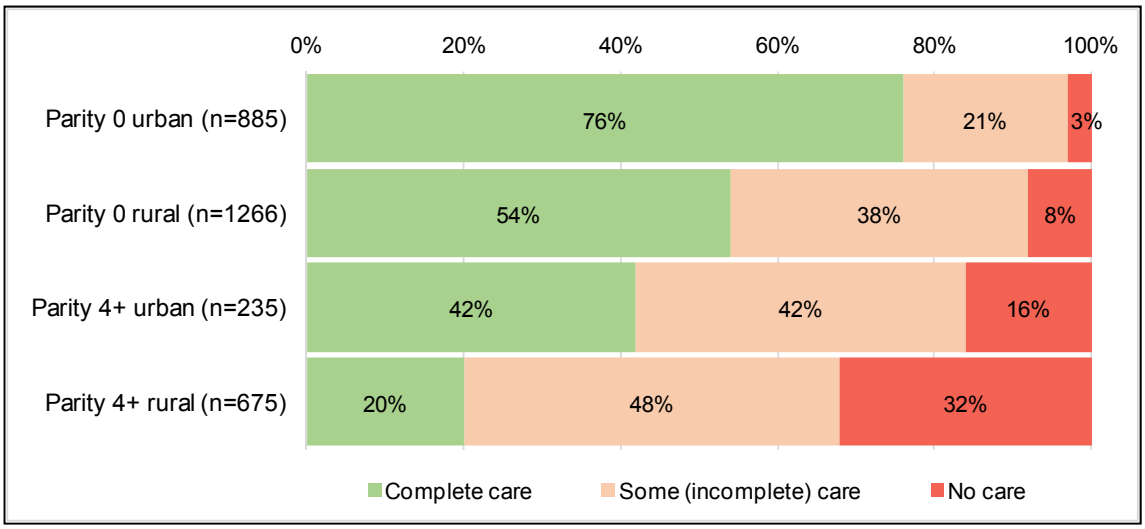
As noted in the preface to each chapter, the findings from this dissertation are in the process of being published in peer-reviewed journals and presented at academic conferences. Namely, Chapters 3, 5 and 8 have been published in peer-reviewed journals on an open-access basis. I intend to submit the analysis of child-health seeking on the DHS (Chapter 6) to a peer-reviewed journal shortly after the submission of this thesis. In addition, Professor Sholkamy and I are currently finalising the analysing the effectiveness of the proxy-means formula in identifying rural poor households (excerpts from which are shown in Chapter 7 and Appendix H) in preparation for publication. I presented the intermediate findings of this dissertation at several academic conferences. Detailed information about these oral presentations is provided in Chapters 5 and 8.

In addition to the various academic fora, I believe it is important to disseminate the findings of this thesis to a broader audience, particularly to Egyptian and international policy-makers and policy-influencers. I have been invited to contribute a background paper on socio-economic inequalities in health for the upcoming 2015 Egypt Human Development Report. This will be an excellent opportunity to highlight the gaps in health-seeking and health systems coverage to an audience of people concerned with and involved in the direction of Egypt's future health and social policies.

Executive-level communication materials using simple appealing visuals could be one of the ways through which to further engage the attention of policy makers and influence the allocation of public resources. For example, it is essential to communicate the finding that large proportions of women in rural Upper Egypt as well as in other parts of the country are not receiving appropriate maternal care. In particular, the receipt of the basic maternal care package (timely antenatal care with 4+ visits and facility delivery) was strongly patterned based on women’s region of residence and parity. This descriptive analysis shows that on the 2008 DHS, 76% of women pregnant with their first child living in urban areas received the complete package, and only 3%

did not receive any maternal care (Figure 9.1). However, the coverage of this intervention decreased rapidly with rural residence and higher parity. Only one in five women with four or more children living in rural areas received the complete package, whereas a third of these women received no maternal care at all. I intend to work with the International Policy Center for Inclusive Growth (IPC-IG/UNDP) in Brazil to generate such brief summaries for their Series of “One-pagers”.[361]

Figure 9.1 Proportions of women receiving the complete maternal care package, by residence and parity



9.4.2 Conclusion

> “A link between poverty and maternal health has been clear for more than a century, and is lent support by extensive evidence from rich countries. ... The reasons for these differences are not well understood. Large discrepancies exist between the rich and the poor in the uptake of antenatal and delivery services, but this is unlikely to be the sole explanation. Indeed, historical and contemporary research shows that there are many dimensions to disadvantage in addition to economic factors, which operate through subtle and indirect pathways to influence outcomes.”[80]

> “Socioeconomic inequities in child survival thus exist at every step along the path from exposure and resistance to infectious disease, through careseeking, to the probability that the child will receive prompt treatment with effective therapeutic agents. The odds are stacked against the poorest children at every one of these steps. As a result, they are more likely than their better-off peers to die in childhood.”[362]

In conclusion, this thesis demonstrated that large socio-economic inequalities in health-seeking behaviours for maternal and child care existed in Egypt. The in-depth analysis of these patterns showed that lower levels of health-seeking among more socio-economically vulnerable households sometimes reflected availability of material/financial resources. However, at other times, these patterns seemed to implicate social preference for privately-provided care, despite its high price. These preferences could be related to poorer objective or subjective quality of care available in public facilities. As shown, the out-of-pocket fees for private antenatal and delivery care are extremely high. Free public care is not reaching the most socio-economically marginalised women, and the failure of effective targeting means that public resources are being wasted. While data on the prices paid for curative care for children were not collected, other studies show that these can be equally catastrophic for poor households. These findings are salient particularly during the current transitional phase in Egypt's political and economic life, which has been accompanied by a rise in poverty levels.

Globally, studies from a variety of contexts repeatedly show large socio-economic inequalities in maternal and child health outcomes such as mortality and morbidity. These inequalities can be seen in levels of child mortality in Egypt, and the difference in child survival between children from poorest and richest households is widest in children aged one to four years. Evidence of socio-economic inequalities in maternal mortality has been shown to exist in other countries,[80] but is not available in Egypt. However, based on the extent of socio-economic inequalities in maternal health-seeking identified by this thesis, it is plausible that the resulting socio-economic gradients in maternal mortality and morbidity are even larger than in child survival. Such inequalities are socially produced and therefore modifiable. Their reduction greatly depends on a better understanding of the process of their production (a task for researchers) and a serious engagement from Egyptian policy-makers and civil servants to ensure that the country's health system delivers acceptable, affordable and good quality care to all citizens.

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10 Appendices

10.1 Appendix A. Systematic review paper (Chapter 3)

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Socio-Economic Gradients in Maternal and Child Health-Seeking Behaviours in Egypt: Systematic Literature Review and Evidence Synthesis

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Abstract

Background: Health-seeking behaviour lies on the direct pathway between socio-economic position (SEP) and health outcomes. The objective of this systematic review is to identify and synthesise evidence of socio-economic gradients in health-seeking behaviours related to maternal and child health in Egypt.

Methods: Four databases (Medline, Embase, Global Health and Web of Science) were searched in September 2013 for material published in English from 1992 to 2013 for a combination of terms describing health-seeking behaviours, indicators of socio-economic position and geographical limitation to Egypt. Findings of studies were described and synthesised in a narrative format as meta-analysis was not possible.

Findings: Among the 786 references identified, 10 articles met the inclusion criteria. Six studies examined maternal and five studies child health-seeking behaviours (one study examined both). For maternal health, three dimensions of health-seeking behaviour (receipt of any care, type of care and intensity of care) were covered by studies of ante-natal and one dimension (type of care) by analyses of delivery care. For child health, two dimensions of preventive care (coverage of and intensity of immunisation) and three dimensions of curative care (receipt of any care, type and cost of care) were analysed.

Conclusions: Based on two studies of time trends in nationally-representative surveys, socio-economic inequalities in seeking care for basic preventive and curative interventions in maternal and child health appear to have narrowed. Limited evidence of gradients in intensity of maternal preventive and provider selection in child curative care showed that inequalities may have widened. In studies of more geographically and socially homogeneous samples, fewer gradients were identified. Current body of evidence contains numerous limitations and gaps and is insufficient to draw a conclusive summary of such gradients. Improved understanding of SEP gradients is crucial in designing and prioritising interventions to equitably improve maternal and child health outcomes.

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Introduction

In virtually every context where they have been studied, inequalities in health outcomes based on living standards or on social hierarchy (as observed through various measures of socio-economic position, SEP) have been identified.[1] This association is hypothesised to arise mainly on the basis of causal pathways, encompassing healthcare access and utilisation, psychosocial determinants, health knowledge and behaviours, as well as environmental hazards.[2–5] As one of these pathways, health-seeking behaviour comprises several sequential decisions and actions through which individuals proceed in their contact with the healthcare system; including experiencing and reporting symptoms, seeking care, choosing a provider, paying for care, adhering to treatment, as well as timing and intensity of follow-up visits. Health-seeking behaviour includes preventive (immunisation or screening) and curative care (after the onset of symptoms).

A review of socio-economic determinants of health-seeking behaviour in low and middle income countries indicated that a variety of individual and households-level indicators have been used to reflect socio-economic position, including education, occupation, absolute or relative poverty level, and access to material, financial and productive resources (income, landholding, assets).[6] Rigorously evaluated interventions, such as conditional cash transfer (CCT) programs, showed that provision of cash transfers to female heads of households can lead to an increase in healthcare utilization patterns.[7] Socio-economic status is hypothesised to influence health-seeking behaviour through several

mechanisms, such as material and intellectual resources and access to health facilities.[8,9] However, individuals rarely make health-related decisions in a social vacuum and their socio-economic position is not solely an individual-level characteristic. Therefore, the association between SEP and health-seeking behaviour can be examined on various levels, spanning from the individual and familial environment, to the wider community and country.

Objectives

The objective of this systematic review is to identify and synthesise evidence published in the previous two decades about the existence, magnitude and trends in socio-economic gradients in health-seeking behaviours related to maternal and child health in Egypt. Firstly, a summary of the types and dimensions of health-seeking behaviour analysed by included studies is presented. Secondly, we synthesise the evidence regarding the extent of gradients identified, and lastly, limitations of current evidence and recommendations for future research are outlined. Maternal health-seeking behaviour for the purposes of this review refers to the timing and intensity of care, as well as provider choice and cost incurred during pregnancy, childbirth and in the immediate post-partum period. Child health-seeking behaviour is defined as actions taken in relation to healthcare for children under five years of age. Preventive and curative health-seeking behaviours are included.

Methods

Data sources and search strategy

Four databases (Medline, Embase, Global Health and Web of Science) were searched in September 2013 for material published in English from 1992 to 2013. Where available, MeSH terms were combined with free-text terms capturing components of health-seeking behaviour (access, utilization, provider selection, and cost of care), a wide range of indicators of socio-economic position (education, literacy, employment, wealth, income, consumption, expenditure, assets, poverty, indebtedness) and geographic limitation to Egypt. The reference lists of included articles were also screened. The complete search strategy is presented in Table 1. The review is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline (Table S1).[10] The review protocol was not registered.

Study selection and data extraction

Abstracts of all references identified in searches were screened and discarded if they did not contain data from Egypt or maternal or child health-seeking behaviour as an outcome measure. Cognizant of the fact that SEP indicators may be included in analyses as confounders and may thus not be identified as exposures in the abstracts, full-text versions of remaining references were screened. At this stage, we eliminated studies without SEP as an exposure or confounder, those in which the SEP variable used was not clearly defined, and those not presenting any statistical test (p value, confidence interval or standard error) of the association between SEP and health-seeking behaviour. Descriptive information abstracted from studies included study design, study objective, study population and data sources, type of health-seeking behaviour examined and measures of SEP used. We classified each study according to its main objective into one of the following three groups: SEP was the main determinant examined by the study, SEP was one of the several risk factors examined by the study or SEP was one of the confounders used in the study. Abstracted information on study findings included type of statistical analysis and tests used, crude and adjusted parameters that quantified the association between SEP measure(s) and health-seeking behaviour outcomes and confounders included in adjusted analyses, if any. No data were obtained from investigators, but results were confirmed with authors of Stephenson et al (2012). For the results of Gwatkin et al (2007), binary significance levels of the concentration indices (<0.05, >0.05) were calculated by using the standard errors by this study.

Analysis

No meta-analysis was performed due to insufficient number of comparable estimates for any single health-seeking behaviour. Findings of studies were described and synthesised in a narrative format. The results of analyses are presented separately for each dimension of health-seeking behaviour: 1) Seeking any care, 2) Type of care sought/received, 3) Intensity of care received, and 4) Cost of care incurred, based on a conceptual approach used by

Table 1. MeSH and text search terms used in databases searched according to algorithm (1 AND 2 AND 3).

Search Concept	Text search terms	MeSH terms
Database	(Medline, Embase, Global Health and Web of Science)	(Medline, Embase and Global Health)
1. Health-seeking behaviour	((health OR health-care OR healthcare OR health-related OR provider OR help OR care OR therap* OR treatment) AND (seeking OR behavio?r OR decision OR choice* OR utili?ation OR narrative OR network)) OR ((illness OR sick*) AND (perception OR narrative)) OR ((out?of?pocket OR private OR health) AND (expen* OR cost* OR payment OR fee OR charge)) OR pathways to doctor OR pathways to the doctor OR health-seeking OR help-seeking OR care-seeking	**Medline:** Attitude to Health, Health Behavior, Illness Behavior, Direct Service Costs, Cost of Illness, Fees, Medical. **Embase:** health related behavior, patient attitude, health care utilization, health care access. **Global Health:** health care utilization, social barriers, Health care costs.
2. Socio-economic determinants	socio-economic OR socioeconomic OR social status OR social class OR social position OR economic position OR poverty OR inequalit* OR gradient* OR deprivation OR SES OR SEP OR employment OR occupation OR unemployment OR education* OR school* OR graduat* OR literacy OR numeracy OR income OR wage OR pension OR salary OR wealth OR asset* OR loan OR debt OR borrow* OR consumption OR expenditure OR spend* OR housing OR crowding OR determinant* OR sociodemographic	**Medline:** Socioeconomic Factors, Sociometric Techniques, Social Class. **Embase:** Social status. **Global Health:** Socioeconomic status.
3. Egypt	Egypt*	**Medline, Embase, Global Health:** Egypt.

* Truncation symbol.

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Pokhrel and colleagues.[11] A risk of bias assessment was developed based on the Newcastle-Ottawa quality assessment scale.[12] This tool was used in consideration of the strengths and limitations of the available evidence.

Results

A total of 786 unique references were identified and screened. The majority (83%) of excluded references did not examine any component of health-seeking behaviour. From 64 references reviewed in full-text, 10 articles met the inclusion criteria (Figure 1). Six studies examined maternal health-seeking behaviours and five studies child health-seeking behaviours (Tables 2 and 3, respectively, studies listed in chronological order by year of publication); one study included both behaviours. Among the ten included studies, nine set out to examine the association between socio-economic position and health-seeking behaviour, either as the main exposure or one of several main exposures.

Maternal health-seeking behaviours

Three of the six studies analysing maternal health-seeking behaviours were based on the nationally representative population-level Demographic and Health surveys (DHS) collected between 1995 and 2008.[13–15] The remaining three studies analysed small samples of (<250) women in specific geographic locations; the city of Alexandria,[16] six villages in Beni Sueif governorate [17] and a Giza village.[18] All six studies were based on cross-sectional data.

Four studies analysed whether women received any ante-natal care (ANC) or ANC from a medical professional during pregnancy (Figure 2, Table 2). The proportion of women receiving any ANC in the samples used by the studies ranged from 33.8% to 71.4% for any ANC and 42.5% to 73.2% for any ANC with a medical professional. Four studies examined ANC regularity (number of ANC visits during pregnancy) and one study each looked at the timing of the first ANC visit and at the pattern of ANC use (combining regularity and timing into one indicator). In regard to delivery care, four studies assessed various characteristics of the health provider (skilled or traditional birth attendant) or facility (any, public, private, home) where women sought care.

Four studies of maternal health-seeking behaviour used women's individual-level SEP measures; education or literacy appeared in four studies and employment-related SEP measurement reflected in occupation status and cash income earnings were used by one study each. Two studies evaluated individual-level SEP measures (education and occupation) of the spouse. All studies that analysed DHS surveys relied partly or solely on quintiles of the wealth index, a household-level measure.[19] Other household-level measures of SEP included family socio-economic status (SES) based on a score suggested in 1983 by Fahmy and Sherbini [20] and binary variables indicating ownership of various assets (land, house, cattle), access to potable water, and monthly meat consumption. One study examined the association between health-seeking behaviour and community-level economic prosperity, which was constructed as mean of the DHS household-level wealth scores within each survey primary sampling unit (PSU). Two of the six studies showed the absolute levels of health-seeking behaviours under investigation for each SEP category. To assess the existence and magnitude of the association between SEP and maternal health-seeking behaviours, four studies used odds ratio measure of effect and two studies presented the value of the concentration index, both relative effect measures.

Ante-natal care. The two studies which analysed more than one DHS survey both reported only a crude measure of association between SEP and health-seeking behaviours (Gwatkin 2007, Khadr 2009), shown in Table 4. However, their use of concentration index, a method which quantifies the extent of a SEP gradient, allowed for comparison of time trends. Concentration index is formally expressed as twice the area under the Lorenz curve of inequality, showing the cumulative distribution of an outcome according to cumulative distribution of wealth. Concentration index values range between -1, indicating absolute inequality of the outcome concentrated among the poorest and +1, showing absolute inequality concentrated among the wealthiest, with 0 signifying perfect equality. The definitions of health-seeking behaviours reported were similar (except for a difference in receiving 'regular' ANC, where definition varied between Gwatkin ≥3 and Khadr ≥4 visits). Both studies showed that women from lower wealth quintiles were significantly less likely to have received any ANC and regular ANC than women from richer wealth quintiles. Concentration index values for 1995 and 2000 differed between the two studies for the four indicators they both evaluated. Wealth score and quintile became available to users of the DHS starting with the 2005 survey, and authors calculated their own wealth index for the two prior surveys, possibly using different component variables, which may be the main reason for this difference. For both indicators of ante-natal care, the concentration index value decreased between the 1995 and 2005 surveys, but remained higher for regular ANC than for any ANC use. Khadr found that while the concentration index value for these two ANC behaviours based on education level remained significant and concentrated among women with higher SEP; the

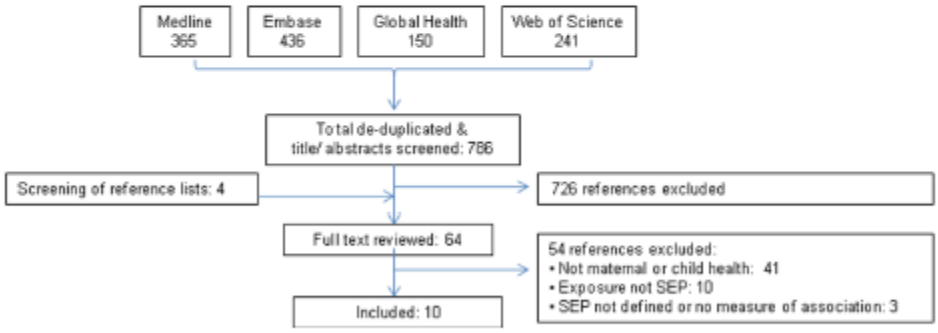

Figure 1. Systematic review search and inclusion flowchart.
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Table 2. Descriptive characteristics of included maternal health-seeking behaviour studies.

#	Author, Year	Study design	Study sample and objective	Exposure: SEP definition	Outcome: Health-seeking behaviour(s) – type, definition and level in sample
1	Abdel Houssein, 1997[16]	Cross-sectional	Pregnant women in third trimester attending 6 randomly selected MOH centers in Alexandria, all pregnant women in third trimester interviewed (no date of study provided), n = 240. SEP: One of risk factors.	**IS: Education level** (no information on number or types of categories). **HH: Family SES score** based on education (woman and husband), monthly per capita income (no further information), crowding and household sanitation.	**Pattern of attendance of ANC clinics:** based on timing of initial visit (1st ANC visit during 1st trimester) and total number of ANC visits for current pregnancy; classified (no further information) into adequate and inadequate. Level: 28.8% adequate.
2	Yassin et al., 2003[17]	Cross-sectional	6 villages in Beni Suef, all mothers of children less than one year old living in an area around a sentinel site (no date of study provided), n = 231. SEP: One of risk factors.	**IS: Literacy** (binary), **occupation** (binary). **IO: Spouse literacy** (binary), **spouse occupation** (binary). **HH: Land ownership** (binary), **house ownership** (binary), **cattle ownership** (binary), **access to potable water** (binary), **meat consumed <4 times in previous month** (binary).	**Receipt of any ANC** at local primary center during most recent pregnancy (with child <1 year old). Level: 33.8% received any ANC.
3	Gwatkin et al., 2007[13]	Cross-sectional	EDHS 1995, 2000. Population representative sample of ever-married women. Last birth among women with at least one birth in the five years preceding the survey, n: 1995 = 7797, 2000 = 7953. SEP: Main determinant.	**HH: DHS Wealth index quintile.**	**Any ANC by a medically-trained person** (at least one consultation from a doctor, nurse or trained midwife). Level: 1995: 42.5%, 2000: 55.7%. **Multiple (3+) ANC visits with medically-trained person.** Level: 1995: 34.9%, 2000: 43.7%. **Delivery with skilled attendance** (doctor, nurse or midwife). Level: 1995: 46.2%, 2000: 60.9%. **Delivery location: Public facility.** Level: 1995: 17.9%, 2000: 22.2%. **Delivery location: Private facility.** Level: 1995: 14.6%, 2000: 26.0%. **Delivery location: Home (woman's or another home).** Level: 1995: 67.0%, 2000: 51.7%.
4	Khadr, 2009[14]	Cross-sectional	EDHS 1995, 2000, 2005 Population representative sample of ever-married women. Last birth among currently married women with at least one birth in the 5-years preceding survey; n: 1995 = 7828, 2000 = 7823, 2005 = 9744. SEP: Main determinant.	**IS: Education level** (no education, some primary, primary to secondary, completed secondary and higher). **HH: DHS Wealth index quintile.**	**Any ANC received** (no further definition). Level: 1995: 42.4%, 2000: 54.1%, 2005: 71.4%. **Regular ANC received** (4+ visits during pregnancy). Level: 1995: 31.0%, 2000: 40.7%, 2005: 61.3%. **Delivery with skilled attendance** (no further definition). Level: 1995: 41.7%, 2000: 55.8%, 2005: 70.5%. **Home delivery.** Level: 1995: 64.5%, 2000: 49.1%, 2005: 33.6%.
5	Chiang et al., 2012[18]	Cross-sectional	2007 survey of married women <50 years from a Giza village, n = 189. SEP: One of risk factors.	**IS: Woman's education** (no primary, completed primary or higher), **existence of cash income** (binary). **IO: Husband's education** (primary school or lower, higher than primary).	**Regular ANC (4+ visits) during most recent pregnancy. Level: 48.7%. Delivery with skilled medical professional at most recent delivery.** Level: 79.4%. **Delivery in a health facility at most recent delivery.** Level: 61.4%.
6	Stephenson et al., 2012[15]	Cross-sectional	EDHS 2008. Population representative sample of ever-married women. Last birth among women with at least one birth in the five years preceding the survey, n = 7813. SEP: One of risk factors.	**C: Community-level economic prosperity** - mean score of household wealth (DHS wealth score) per PSU (primary sampling unit), continuous variable.	**Any ANC received** (from a medically trained person). Level: 73.23%. **Regular ANC received** (4+ visits). Level: 65.75%. **First ANC visit received in 1st trimester.** Level: 59.48%. **Delivery in a health facility.** Level: 712.5%.

EDHS – Egypt Demographic and Health Survey. Measures of SEP: **IS**: Individual – self, **IO**: Individual– other (spouse, mother, etc), **HH**: Household-level, **C**: Community-level.

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Table 3. Descriptive characteristics of included child health-seeking behaviour studies.

#	Author, Year	Study design	Study sample and objective	Exposure: SEP – type, definition, level in sample	Outcome: Health-seeking behaviour(s) – type, definition and level in sample
1	Reichler et al, 1998[26]	Cross-sectional	Nationally-representative survey of children under 48 months of age surveyed one month after second National Immunisation Day (NID, polio) round in 1995, n = 41 88 children from 3216 households. SEP: One of risk factors.	**HH: Radio in household** (binary), **TV in household** (binary).	**Number of doses of OPV (oral poliomyelitis vaccine) received.** Level: 0 doses: 9% (CI95%: 7.1%–9.9%). Level: 1 dose: 17% (CI95%: 14.6%–19.7%). Level: 2 doses: 74% (CI95%: 71.4%–77.3%).
2	Yount, 2003[27]	Cross-sectional.	Two Governorates Linkages Survey 1995–1997, children <5 years with diarrhoea in past 2 weeks in 12 rural villages of Minya governorate, n = 129 children, 152 episodes of care-seeking. SEP: Confounder in analysis of gender.	**IO: Maternal education** (binary). **HH: Major asset ownership** (binary).	If reported symptoms of diarrhoea: **Type of provider sought** (episodes, n = 152). Other:15%, Lay:16%, Pharmacist: 40%, Doctor: 29%. **Location of care** (episodes, n = 152). Other: 28%, Public:12%, Private: 21%, Pharmacy: 39%. **Cost of care** (children, n = 129). Free, ≤ 1 EPG, > 1 EGP (Proportions by category not provided, but median expenditure for boys 0.5 EGP, girls 0.2 EPG).
3	Yount, 2004[28]	Cross-sectional	Two Governorates Linkages Survey 1995–1997, Minya governorate, children <5 years of age of currently married women who were sick in 2 weeks before interview, n = 1579. SEP: One of risk factors.	**IO: Mother's education level** (none, primary, preparatory, secondary and higher, **mother's ever-employment for cash** (binary), **mother's ownership of assets** (none, one, two or more), **father's years education** (none, 1–11, 12+). **HH: Number of assets/durables owned:** (none, low [1 asset/0–2 durables], medium [≥1 asset, 3+ durables], high [2+ assets]. (Assets include 6 items of means of transportation, land and building ownership; Durables are 10 household assets such as TV, fridge etc.)	If reported symptoms of illness (with diarrhoea, fever, cough or rash): **Utilized private treatment (private doctor).** Level: 18.8%.
4	Fadel, et al. 2007[29]	Prospective cohort	257 healthy infants (0–9 months) followed for 12 months (October 1999–October 2000) in Assiut university primary health center catchment area, n = 631 diarrhoeal episodes. SEP: One of risk factors.	**IO: Mother's education, father's education** (illiterate, literate/primary, preparatory, secondary, university/higher), **mother's employment status** (binary). **HH: TV ownership** (binary), **Radio ownership** (binary).	If reported symptoms of diarrhoea in preceding 2 weeks: **Sought any treatment** (caretakers of children sought medical care outside the home). Level: 53.1% of diarrhoeal episodes (335 of 631). **Utilized private treatment** (medical care not under government control). Level: 37.3% of diarrhoeal episodes for which care was sought (210 of 335).
5	Gwatkin,et al, 2007[13]	Cross-sectional	EDHS 1995, 2000 (children under 5 years), n immunization: 1995 = 2085, 2000 = 2170; treatment for ARI: 1995 = 2479, 2000 = 1032; treatment for fever: 1995 = 4295, 2000 = 1923; treatment for diarrhoea: 1995 = 1701, 2000 = 771. SEP: Main determinant.	**HH: DHS Wealth index quintile**	**Coverage of immunisations:** BCG: 1995: 94.7%, 2000: 99.3%. Measles: 1995: 89.2%, 2000: 96.9%. DPT(3 doses): 1995: 83.0%, 2000: 94.0%. Hepatitis B: 1995: 57.0%, 2000 not reported. Full basic: 1995: 79.1%, 2000: 92.2%. No basic (not received full basic): 1995: 2.5%, 2000: 0.2%. **Sought any medical treatment.** Fever: 1995: 47.6%, 2000: 35.1%. ARI: 1995: 61.7%, 2000: 66.0%. Diarrhoea: 1995: 47.5%, 2000: 46.3%. **Utilized private treatment.** Fever: 1995: 34.8%, 2000: 21.7%. ARI: 1995: 43.5%, 2000: 41.5%. Diarrhoea: 1995: 33.2%, 2000: 30.0%. **Utilized public treatment.** Fever: 1995:12.0%, 2000: 12.6%. ARI: 1995: 17.1%, 2000: 23.1%. Diarrhoea: 1995: 13.7%, 2000: 15.6%.

EDHS – Egypt Demographic and Health Survey EGP – Egyptian pound BCG – Bacillus Calmette–Guérin (TB) DPT- Diphtheria, pertussis (whooping cough) and tetanus. Measures of SEP: **IO:** Individual – other (spouse, mother, etc), **HH:** Household-level.

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values were closer to equality than the concentration index values based on wealth quintile.

In order to approximate the level of community affluence, Stevenson et al (2012) constructed a community level wealth index based on the household wealth index of respondents in the same primary sampling units. This study concluded that community-level economic prosperity was not associated with any ANC, regular ANC or timely ANC (first visit in first trimester of

Domain	Dimension	Health-seeking behaviour	Study #
Maternal health			
Ante-natal care	1. Any care received	Any ANC received	2, 4
	2. Type of care (provider, facility)	Any ANC with medical professional	3, 6
	3. Intensity (frequency, timing)	Regularity of ANC (> or ≥3 visits)	3, 4, 5, 6
		Timing of ANC (start in 1st trimester)	6
		Pattern of ANC (adequate timing and regularity)	1
Delivery care	2. Type of care (provider, facility)	Delivery with skilled attendance	3, 4, 5
		Delivery at any health facility	5, 6
		Delivery at public facility	3
		Delivery at private facility	3
		Delivery at home	3, 4
Child health			
Immunisation	1. Any care received	Immunisation received (various types)	1,5
	3. Intensity (coverage)	Full basic immunisation	5
Childhood illness	1. Any care received	Any medical assistance received	4, 5
	2. Type of care (provider, facility)	Type of healthcare provider	2
		Type of facility	2
		Private care (binary)	3, 4, 5
		Public care (binary)	5
	4. Cost of care	Amount spent	2

Preventive care — Curative care

Figure 2. Maternal and child health-seeking behaviours analysed in included studies.
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pregnancy) use. Receiving regular ANC in a Giza village was associated with primary or higher education level - both woman's as well as her husband's, but not with woman's cash income, in crude analysis (Chiang 2012). Crude analysis of a sample from villages in Beni Sueif showed a significant positive association between maternal and paternal literacy (individual-level) and land ownership (household-level) with the likelihood of receiving any ANC (Yassin 2003). A study in Alexandria reported that neither education nor family SES score were significantly associated with adequate pattern of ANC clinic attendance among women attending an ANC clinic, when adjusted for woman's age group, parity, knowledge of ANC use, level of medical risk, and health belief model score (Abdel Houssein 1997).

Delivery care. The concentration index values for obtaining skilled delivery care appeared to have decreased between 1995 and 2005, yet the values remained significant, and higher based on wealth quintile than on education level (Gwatkin 2007, Khadr 2009). Gwatkin and colleagues reported that women from lower household wealth quintiles were significantly less likely to deliver in private facilities and in public facilities, compared to women from higher quintile households, in both 1995 and 2000, but the concentration index value had decreased over this timeframe. Both Gwatkin and Khadr concluded that women from lower wealth quintiles were significantly more likely to deliver at home in all surveys analysed. However, whereas Gwatkin reported that the concentration index value increased between 1995 and 2000, Khadr noted a decrease between 1995 and 2005. Khadr's analysis showed that the concentration index value for home delivery was smaller when SEP was measured by education level rather than household wealth quintile, but remained significant, favouring women with higher SEP. Using the 2008 DHS, Stephenson et al reported no significant difference, in adjusted analysis, in the odds of delivery in any health facility compared to at home based on community-level wealth. Lastly, crude analysis of health-seeking behaviour in a Giza village revealed that higher level woman's and husband's education were significantly positively associated with the odds of delivery with a skilled medical professional and delivery in any health facility. However, woman's cash income was not associated with either delivery-related health-seeking behaviour (Chiang 2012).

Child health-seeking behaviours

Five studies analysing SEP determinants of health-seeking behaviour for children were identified; two included assessment of immunisation coverage and four examined aspects of curative health-seeking for common childhood illnesses (Figure 2, Table 3).

Table 4. Summary of results from included maternal health-seeking studies.

#	Author, Year	Statistical method, type of analysis, effect estimate	Results and confounders (if applicable)
1	Abdel Hussein, 1997[16]	**Crude analysis:** Not reported. **Adjusted analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Pattern of attendance of ANC clinics:** Education (number of categories not reported): OR 1.42 (0.64–3.13), p = 0.387. SEP (ref category not specified) OR 1.38 (0.75–2.56), p = 0.302. **Confounders:** age group (<20, 21–29, 30+), parity (0, 1–4, 5+), knowledge about adequate ANC use, level of risk, and health belief model score.
2	Yassin et al, 2003[17]	**Crude analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Any ANC:** Maternal literacy (ref: literate) OR 3.3 (1.6–6.7), p<0.001. Maternal occupation (ref: unskilled worker) OR 0.8 (0.3–1.8), p>0.05. Paternal literacy (ref: literate) OR 3.1 (1.4–6.9), p<0.01. Paternal occupation (ref: unskilled worker) OR 1.8 (0.7–4.5), p>0.05. Land ownership (ref: yes) OR 3.6 (1.4–9.3), p<0.01. House ownership (ref: yes) OR 1.0 (0.3–3.5), p>0.05. Cattle ownership (ref: yes) OR 0.5 (0.3–1.1), p>0.05. Access to safe water OR 1.1 (0.6–2.2), p>0.05. Meat consumption (ref: <4 times/month) OR 0.9 (0.4–2.1), p>0.05.
3	Gwatkin et al, 2007[13]	**Crude analysis:** Concentration index (CoI)*. **Effect estimate:** Concentration index value.	**Any ANC by a medically trained person:** Women from households in lower quintiles were less likely to receive but CoI decreased from 0.2703 (p<0.05) in 1995 to 0.2028 (p<0.05) in 2000. **Multiple (3+) ANC visits:** Women from households in lower quintiles were less likely to receive multiple ANC visits, but CoI decreased from 0.3580 (p<0.05) in 1995 to 0.2614 (p<0.05) in 2000. **Delivery with skilled attendance:** Women from households in lower quintiles were less likely to deliver with skilled medical assistance, but CoI decreased from 0.2911 (p<0.05) in 1995 to 0.2189 (p<0.05) in 2000. **Delivery location:** Public or Private facility: Women from households in lower quintiles were less likely to deliver in private facilities (CoI1995: 0.4379, p<0.05; CoI2000: 0.3422, p<0.05) and in public facilities (CoI1995: 0.2472, p<0.05; CoI2000: 0.1708, p<0.05), both indexes decreased between 1995 and 2000. **Delivery location: Home:** Women from households in lower quintiles were more likely to deliver at home and gradient increased over time (CoI1995: −0.1630, p<0.05; CoI2000: −0.2457, p<0.05).
4	Khadr, 2009[14]	**Crude analysis:** Concentration index (CoI). **Effect estimate:** Concentration index value.	**Any ANC received:** Education: CoI value has remained the same (0.41) between 1995 and 2005 (p<0.001). Wealth: Decreased inequality from 0.50 (1995) to 0.45 (2005) but significant (p<0.001). **Regular ANC received:** Education: Decreased inequality from 0.49 (1995) to 0.39 (2005) but significant (p<0.001). Wealth: Decrease in inequality from 0.60 (1995) to 0.49 (2005) but significant (p<0.001). **Delivery with skilled attendance:** Education: Decrease in inequality from 0.41 (1995) to 0.37 (2005) but significant (p<0.001). Wealth: Decrease in inequality from 0.55 (1995) to 0.47 (2005) but significant (p<0.001). **Home delivery:** Education: Decrease in inequality from −0.42 (1995) to −0.35 (2005) but significant (p<0.001). Wealth: Decrease in inequality from −0.53 (1995) to −0.47 (2005) but significant (p<0.001).
5	Chiang et al, 2012[18]	**Crude analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Regular ANC:** Maternal education (ref: no primary education) OR 5.59 (2.98–10.47), p<0.01. Cash income (ref: no) OR 0.52 (0.25–1.09), p>0.05. Husband education (ref: ≤primary) OR 2.31 (1.26–4.23), p<0.01. **Delivery with skilled medical professional:** Maternal education (ref: no primary education) OR 2.98 (1.36–6.54), p<0.01. Cash income (ref: no) OR 0.79 (0.34–1.85), p>0.05. Husband education (ref: ≤primary) OR 2.38 (1.05–5.36), p<0.05. **Delivery in a health facility:** Maternal education (ref: no primary education) OR 5.42 (2.78–10.57), p<0.01. Cash income (ref: no) OR 0.51 (0.25–1.04), p>0.05. Husband education (ref: ≤primary) OR 2.82 (1.46–5.42), p<0.01.
6	Stephenson et al, 2012[15]	**Crude analysis:** Not reported. **Adjusted analysis:** Multi-level logistic regression. **Effect estimate:** Odds ratio.	**Any ANC received:** OR 1.0 (1.0–1.0), p>0.05. **Regular ANC received:** OR 1.0 (1.0–1.0), p>0.05. **First ANC in 1st trimester:** OR 1.0 (1.0–1.0), p>0.05. Delivery in a health facility: OR 1.0 (1.0–1.0), p>0.05. **Confounders:** Woman's age, marriage duration, partner age difference, death of a child, number of living children, sex ratio of children, education (woman and partner), employment status (woman and partner), household wealth, reproductive health knowledge, media exposure, violence justification, and decision-making autonomy.

* Only values of standard error (SE) were provided by this study. Binary significance levels (<0.05, >0.05) were calculated by multiplying the SE by 1.96 to obtain the upper and lower confidence intervals.

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Two studies analysed nationally-representative samples; one by following up on National Immunisation Days (Reichler 1998) and the other examined two rounds of EDHS (Gwatkin 2007). Two papers reported findings from samples in Minia governorate based on the Two Governorates Linkages Survey (Yount 2003 and Yount 2004), and the remaining study assessed health-seeking behaviours for infants in a primary health centre catchment area in Assiut (Fadel 2007). Although this study included prospective cohort data collection method, all findings were based on cross-sectional analyses.

Between the two studies examining receipt of immunisations, socio-economic determinants of both disease-specific coverage BCG, measles, DPT, Hepatitis B, polio), as well as overall immunisation status based on national guidelines (full basic immunisation, no basic immunisation) were assessed. In regard to curative care, health-seeking behaviours following reported childhood illnesses (any illness, diarrhoea, acute respiratory infection-ARI, or fever) were examined, specifically whether any medical care was sought, the type of medical provider and health facility approached, and cost incurred. Three of the five studies used measures of parental SEP, namely maternal and paternal education level and employment status, and maternal asset ownership. All three studies using individual-level variables also used household-level measures of SEP, the remaining two studies analysed solely household-level measures. The household-level SEP measures included DHS wealth quintiles, binary TV and radio ownership, and major asset ownership. Four of the five studies showed the absolute levels of health-seeking behaviours under investigation for each SEP category. The assessment of the association between SEP and maternal health-seeking behaviours was conducted using relative effect measures in four studies (three used odds ratios and one concentration index value) and absolute measure in one study (risk difference).

Immunisation coverage. Both studies examining the association between SEP and receipt of immunisations presented only crude effect estimates (Table 5). In their analysis of polio vaccine

Table 5. Summary of results from included child health-seeking studies.

#	Author, Year	Statistical method, type of analysis, effect estimate	Results and confounders (if applicable)
1	Reichler et al, 1998[26]	**Crude analysis:** T-test. **Effect estimate:** Risk difference.	Children in households with a radio were more likely to have received 2 doses (77%) than one (69%) or no doses of OPV (72%), p<0.01. Children in households with a TV were more likely to have received 2 doses (94%) than one (86%) or no doses of OPV (84%), p<0.001.
2	Yount, 2003[27]	**Crude analysis:** Not reported. **Adjusted analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Type of provider**: Household assets (ref: none) Any: Pharmacist OR 1.78 (p>0.05), Doctor OR 2.46 (p>0.05). Maternal education (ref: none) Any: Pharmacist OR 2.10 (p>0.05), Doctor OR 0.75 (p>0.05). **Location of care**: Household assets (ref: none) Any: Public OR 3.65 (p>0.05), Pharmacy OR 2.01 (p>0.05), Private OR 2.20 (p>0.05). Maternal education (ref: none) Any: Public OR 0.66 (p>0.05), Pharmacy OR 2.09 (p>0.05), Private OR 0.72 (p>0.05). **Cost of care** (categorical variable, 3 levels): Household assets (ref: none) Any: OR 0.76 (p>0.05). Maternal education: not reported. **Confounders**: child gender and age; severity, cause and duration of diarrhoea; presence and gender of siblings; and family members' involvement in decision-making.
3	Yount, 2004[28]	**Crude analysis:** Not reported. **Adjusted analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Odds of utilizing private treatment:** Father's education (ref: 0 years): 1–11 years OR 0.84 (p>0.05); 12+ years OR 1.10 (p>0.05). Maternal ever-employment (ref: no): Yes: OR 0.79 (p>0.05). Maternal education (ref: none): Primary/preparatory: OR 0.81 (p>0.05), secondary or more: OR 0.92 (p>0.05). Maternal assets (ref: none): One OR 0.74(p<0.05), Two or more: OR 0.79 (p>0.05). Household assets/durables (ref: none): Low: OR 1.84 (p<0.01), Medium: OR 2.55 (p<0.001), High: OR 3.62 (p<0.001). **Confounders**: child gender and age; severity, cause and duration of illness; presence and gender of siblings; religion; urban/rural residence; maternal social resources and social constraints; and proximity of health services.
4	Fadel, et al. 2007[29]	**Crude analysis:** X^2 test. **Adjusted analysis:** Logistic regression. **Effect estimate:** Odds ratio.	**Crude analysis - Utilized treatment:** Mother's education p = 0.285, Father's education p = 0.339, Mother's employment status p = 0.486, TV ownership p = 0.042 (diarrhoeal episodes where households have TV more likely to utilize care), Radio ownership p = 0.196. **Utilized private providers, if utilized treatment:** Mother's education p<0.001 (higher levels of education are more likely to utilize private providers), Father's education p = 0.020 (higher levels of education are more likely to utilize private providers), Mother's employment status p<0.001 (working mothers are more likely to utilize private providers), TV ownership, Radio ownership: not reported. **Adjusted analysis - Utilized treatment:** Mother's education, Father's education, Mother's employment status, Radio ownership: not reported. TV ownership (ref: not clear) OR 0.63, p = 0.418. **Confounders**: Perception of severe attack, vomiting, bloody stool, fever, duration of episode, age of infant, frequency of stool, presence of cough, associated any symptoms with diarrhoea, watery stool, history of child death, presence of preschool children, using self-prescribed drugs. **Utilized public versus private providers:** Mother's education (ref: illiterate): reads/writes/primary: OR 0.04 (p<0.001), preparatory: OR 0.02 (p<0.001), secondary: OR 0.04 (p<0.01), university/higher: OR 0.07 (p<0.01). Father's education (ref: illiterate): reads/writes/primary: OR 2.04 (p = 0.212), preparatory: OR 1.27 (p = 0.726), secondary: OR 0.82 (p = 0.785), university/higher: OR 1.93 (p = 0.209). Mother's employment status (ref: not working): working: OR 0.61 (p = 0.278). TV ownership, radio ownership: not reported. **Confounders**: age and sex of infant, mother's age and mother's perception of diarrhoeal episode severity.
5	Gwatkin, et al, 2007[13]	**Crude analysis:** Concentration index (CoI)*. **Effect estimate:** Concentration index value.	**Coverage of immunisation:** BCG: Children from lower quintiles less likely covered, CoI decreased from 0.0317 (p<0.05) in 1995 to 0.004 (p<0.05) in 2000. Measles: Children from lower quintiles less likely covered, CoI decreased from 0.058 (p<0.05) in 1995 to 0.009 (p<0.05) in 2000. DPT: Children from lower quintiles less likely covered, CoI decreased from 0.0691 (p<0.05) in 1995 to 0.0022 (p>0.05) in 2000. HepB: Children from lower quintiles less likely covered, 0.0984 (p<0.05) in 1995, no 2000 estimate. Full basic: Children from lower quintiles less likely covered, CoI decreased from 0.0819 (p<0.05) in 1995 to 0.0052 (p>0.05) in 2000. No basic: Children from lower quintiles more likely to have no coverage, CoI decreased from −0.7434 (p<0.05) in 1995 to −0.7212 (p>0.05) in 2000. **Sought any treatment**: Fever: Children from lower quintiles less likely to receive, CoI decreased from 0.1076 (p<0.05) in 1995 to 0.077 (p<0.05) in 2000. ARI: Children from lower quintiles less likely to receive, CoI decreased from 0.0965 (p<0.05) in 1995 to 0.0897 (p<0.05) in 2000. Diarrhoea: Children from lower quintiles less likely to receive, CoI increased from 0.0357 (p<0.05) in 1995 to 0.0688 (p<0.05) in 2000. **Utilized private provider:** Fever: Children from lower quintiles less likely to receive, CoI increased from 0.1609 (p<0.05) in 1995 to 0.1928 (p<0.05) in 2000. ARI: Children from lower quintiles less likely to receive, CoI increased from 0.1543 (p<0.05) in 1995 to 0.1932 (p<0.05) in 2000. Diarrhoea: Children from lower quintiles less likely to receive, CoI increased from 0.1095 (p<0.05) in 1995 to 0.1713 (p<0.05) in 2000. **Utilized public treatment**: Fever: Children from lower quintiles more likely to receive, CoI increased from −0.0411 (p>0.05) in 1995 to −0.1240 (p<0.05) in 2000. ARI: Children from lower quintiles more likely to receive, CoI increased from −0.0469 (p<0.05) in 1995 to −0.0892 (p<0.05) in 2000. Diarrhoea: Children from lower quintiles more likely to receive, CoI decreased from −0.1446 (p<0.05) in 1995 to −0.1180 (p<0.05) in 2000.

* Only values of standard error (SE) were provided by this study. Binary significance levels (<0.05, >0.05) were calculated by multiplying the SE by 1.96 to obtain the upper and lower confidence intervals.

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coverage during the 1995 National Immunisation Days, Reichler et al concluded that children living in households with a radio or a TV were significantly more likely to have received two oral polio virus vaccine doses than one or zero doses. Using concentration index based on household wealth quintile, Gwatkin et al reported that children from lower quintile households were less likely to be immunised against BCG, measles, and DPT (3 doses) than those from higher quintiles, although the concentration index value had decreased between 1995 and 2000. The concentration index value for Hepatitis B immunisation was only available for 1995 and showed the highest level (higher coverage among children from wealthier quintile households) among the various vaccines. Children from lowest wealth quintile households were significantly more likely to have received no basic immunisation coverage, and the concentration index value declined only marginally in the five-year period between surveys.

Curative care. In terms of the first dimension of curative health-seeking, seeking advice from a medical provider, Gwatkin's crude analysis showed that children from lower quintiles were less likely to receive care with symptoms of fever, acute respiratory infection (ARI) and diarrhoea compared to children from higher quintile households. However, whereas the concentration index value decreased between 1995 and 2000 for symptoms of fever and ARI, these values increased with respect to diarrhoea. The highest concentration index value in 2000 for this dimension was seen in health-seeking for symptoms of ARI. In a small sample of infants in Assiut, Fadel examined the association between SEP and seeking medical advice following symptoms of diarrhoea. In crude analysis, only household TV ownership was marginally positively associated with seeking care, but ceased to be significant in adjusted analysis.

Four studies examined the association between SEP and type of care chosen for childhood illness among the subsamples of children for whom any medical care was sought. In the nationally-representative DHS surveys, Gwatkin reported results of a crude association, finding that children from lower quintile households were less likely to have received care from a private provider. Whereas the concentration index value was smaller for symptoms of diarrhoea compared to ARI or fever in both surveys, the value had increased for all three illnesses between 1995 and 2000. Among infants in Assiut for whom medical care was sought for diarrhoea, utilisation of private care was associated with higher levels of both mother's and father's education, as well as mother's employment status in crude analysis (Fadel 2007). Among these three SEP indicators, only mother's education remained significantly positively associated with private care utilisation in adjusted analysis. In a sample of children taken for care for diarrhoea, fever, cough or rash in Minia, adjusted odds of seeking a private doctor were significantly higher for those with higher number of maternal as well as household assets, but not associated with maternal or paternal education or maternal ever-employment (Yount 2004). Analysing a smaller sample of children with diarrhoea in Minia, Yount (2003) found that neither the type of medical provider (doctor, pharmacist, other, lay) nor the type of facility (public, private, pharmacy) sought was associated with maternal education or household assets in adjusted analysis. This study also found no association, after adjustment for various confounders, between household asset ownership and cost of care incurred.

Discussion

Studies using nationally representative datasets found evidence of an association between SEP and maternal health-seeking behaviours. Women living in lower wealth quintile households were less likely than those from wealthier households to receive any and regular ANC, to deliver with skilled attendance and in health facilities. The magnitude of this association appeared smaller when women's SEP position was measured by education level compared to household wealth. However, no association was found between community-level affluence and maternal health-seeking behaviours. These differences in the existence and extent of SEP gradients raise the question whether material/financial resources may be a more important determinant of utilisation (potentially via direct and indirect costs of care) than women's knowledge of the need for care or its availability. On the other hand, the only adjusted analysis of a small sample found that women's education or household-level SES score did not predict the pattern of ANC attendance among women attending ANC clinics, potentially suggesting that once women access ANC care, determinants other than SEP contribute to the intensity of care they receive.

Children from wealthier households were significantly more likely to have been immunised, for separate illnesses and for a combination of basic immunisations, compared to children from poorer households. Analysis of time trends revealed that this gradient had decreased between 1995 and 2000, potentially as a result of high overall immunisation coverage. Crude analysis of a nationally representative sample showed that the gradient in care-seeking for symptoms of childhood illnesses favoured children from higher wealth quintile households, but while remaining significant, decreased over time. A significant and increasing inequality in private provider use based on household wealth was identified for all three childhood illnesses examined. This may be a result of the fact that the cost of private care is higher than of public care.[21,22] However, in smaller samples from Upper Egypt, conflicting results about the existence of an association between SEP and utilisation of any curative care and private provider selection for child illnesses were reported. This may be due to real differences between the populations from which samples were drawn, or be partially or fully explained by the difference in analysis methods (crude versus adjusted) or definition of illness (diarrhoea and any illness). The evidence on existence of an association between SEP and the cost of care-seeking was limited to one study (not adjusted for provider type) of a small sample, and therefore carried limited generalizability.

Limitations of available evidence

We considered selection bias, information bias (related to exposure or outcome) and analysis methods in assessing data quality of each study (Table 6).

Five studies used nationally representative survey data. Whereas the remaining smaller surveys considered selection bias (by including, for example, all women attending ANC, all mothers living in villages, or utilising simple random sampling in a community), they often neglected to describe the specifics of the population their samples represent. It was unclear whether sample sizes were calculated based on sufficient power to detect gradients in health-seeking behaviours, or whether previously collected data was used in analysis of health-seeking. Therefore, the findings of several such studies have limited generalizability not only on the general population level, but also for the understanding of local-level determinants of health-seeking. All included studies relied on cross-sectional analysis, and no analysis of individual-level time patterns of health-seeking behaviours was presented.

Two of the included studies specifically analysed socio-economic determinants of health-seeking behaviours. Seven studies attempted to identify determinants of health-seeking behaviours and one paper included SEP as a confounder in analysis of gender. Studies using separate variables, such as education level or binary asset ownership described the definition and categorisation of exposure categories better than those using component variables (SES score, household wealth quintile). Potential bias may stem from data collection methods – studies failed to report on and examine which member of the household reported on the various indicators of SEP (own, other members' or household-level) and whether this person could do so reliably.

Limitations in the definitions of health-seeking behaviours in included studies relate mainly to type of provider or facility. The method of categorising health providers into skilled or unskilled and health facilities into public or private was not always made explicit and may have relied of respondents' self-report. This concern is particularly pertinent to the use of pharmacies without previous medical consultation, a common practice in Egypt. The

Table 6. Risk of bias in included studies.

	Health-seeking behaviour	Maternal								Child				
Risk of bias category	Study	Abdel Hoseeb, 1997	Yassin, 2003	Gwatkin, 2007	Khadr, 2009	Chang 2012	Stephenson, 2012	Reichler, 1998	Youm, 2003	Youm, 2004	Fadel, 2007	Gwatkin, 2007
Selection	Representativeness (consecutive or obviously representative)	-	?	+	+	?	+	+	?	?	?	+
	Missing data or loss to follow up minimal	?	?	+	+	?	+	?	?	?	?	+
Exposure (SEP)	Clear definition of exposure	-	+	?	+	+	?	+	+	+	+	?
	Ascertainment of exposure	?	+	+	+	+	+	+	+	+	?	+
Outcome (HSB)	Clear definition of outcome	-	+	+	+	+	+	+	?	?	+	+
	Ascertainment of outcome	-	+	?	?	+	?	?	+	+	+	?
Analysis	Statistical test used to analyze the data is clearly described* and appropriate	+	+	+	+	+	?	+	+	+	+	+
	Minimal adjustment for age (maternal, child), parity (maternal) and gender (child)	+	-	-	-	-	+	-	+	+	+	-
	Correctly adjusting for several indicators of SEP	-	NA	NA	NA	NA	-	NA	-	-	-	NA

SEP – socio-economic position, HSB – health-seeking behaviour.
* Presenting a test of statistical significance was one of the inclusion criteria.
NA – not applicable (no adjusted analysis was conducted).
Key: + Low risk of bias, ? Potential/unclear risk of bias, - High risk of bias.
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existence and extent of an SEP gradient by provider type may change as a result of the inclusion and categorization of pharmacies. Misclassification may have occurred in regard to type of provider, because many public sector medical professionals also practice privately. In addition, respondents may not know, correctly recall, or be willing to report the level of medical qualification of the provider used. The recall period used by studies for reporting of health-seeking behaviours seemed appropriate – longer for maternal care where information surrounding a birth is more likely to be remembered, and shorter (two weeks preceding survey or prospective data collection) for events related to child health. Child curative care relies heavily on the perception and reporting of child ill health. However, only Yount 2004 and Fadel 2007 used perceived severity of illness in their adjusted analyses of health-seeking determinants. On the conceptual level, the use of such an approach also challenges the underlying assumption that all perceived childhood illness symptoms ought to be attended to by a health provider.

Several important gaps in the body of evidence are present. In regard to maternal health-seeking, no study analysed SEP determinants of the type of facility (public or private) chosen by users of ante-natal care. Further, no study modelled the intensity of ANC care as a continuous variable, which would enable detailed analysis of the dose-response effects of SEP. No analysis of post-natal care, a crucial component of the maternal health package, was identified. Neither the determinants of facility level (health centre, hospital) nor of a combination of provider qualification and facility characteristics were examined for delivery care health-seeking. Lastly, expenditures related to maternal health-seeking and their association with SEP were not examined by any study. In comparison with maternal care, available evidence for child health-seeking included more dimensions of behaviours related to curative, but less for preventive care. No studies analysed types of providers and facilities approached or costs encountered in obtaining childhood immunisations. No evidence examining gradients in intensity of care (number of visits made and types of providers approached, if more than one) received for childhood illnesses was identified. Lastly, the type of symptoms for which curative health-seeking was analysed is limited to three; no evidence examining other important issues, such as childhood injuries or mental health was identified.

The use of a statistical test to assess the existence and extent of SEP gradients was an inclusion criterion in this review. However, included studies suffered from several other limitations in their analyses. Six studies only presented results of crude analyses and this was a major limitation of the usefulness of studies that employed nationally-representative data. The usefulness of analyses to policy is also limited by the number of following dimensions of health-seeking behaviour assessed in any given study. A gradient in intensity of care (dimension 3) may not only be a result of inequalities experienced at that point, but also a consequence of accumulated inequalities in seeking care (dimension 1) and the type of provider used (dimension 2). For example, in the only analysis of cost of care identified by this review (Yount, 2003), adjusted analysis did not include provider type and cannot therefore elucidate the SEP gradient in expenditures based on provider choice. Further, all five studies presenting adjusted analyses used various SEP indicators in one adjusted model, thereby controlling for (eliminating) the pathways of association from one SEP indicator through those remaining.

Strengths and limitations of systematic review

In addition to limitations of the studies included in this review and the gaps in the body of evidence, limitations of this systematic review were also assessed. The search strategy targeted global and regional databases, but only English sources were searched. Complete retrieval of studies identified for full-text review was achieved. Health-seeking behaviour is not a new concept, although it is a recent term, and care was taken to identify and use as many synonyms and components as possible in the text and MeSH terms used. Likewise, a wide range of potential SEP indicators was compiled and used in searches. However, the search strategy may have missed studies which used socio-economic indicators as confounders, but did not list them in the title, abstract or keywords. One author was responsible for study selection and data extraction. Most studies looked at a range of factors associated with health-seeking behaviours, not solely SEP. Therefore, while no formal assessment of publication bias was conducted, it is possible that studies which failed to find an association between health-seeking behaviour and SEP did not report the estimates. Such studies may also not have been submitted or accepted for publication. Despite the fact that only quantitative studies assessing the existence and extent of SEP gradient were included in the review, it was not possible to produce a summary measure of association due to the variability of definitions, effect estimates and analysis methods in individual studies.

Conclusion

Following large improvements in coverage of maternal and child health interventions in Egypt, socio-economic inequalities, and in particular the rural concentration of poverty, have been identified as the primary determinants of remaining disparities.[23,24] As one of the pathways in this association, health-seeking behaviours could contribute to such gradient in health outcomes. While the body of evidence presented in this study contains several limitations, we have attempted to synthesise the available evidence related to inequalities in dimensions of maternal and child health-seeking behaviour.

On the national level, socio-economically patterned inequalities in seeking any care for basic preventive and curative interventions in maternal and child health appear to have narrowed, potentially as a result of increased overall coverage. However, the extent of this gradient seems larger measured by wealth compared to education, and further exploration to determine whether and how knowledge and affordability of care drive these inequalities is necessary. On the other hand, the limited evidence of gradients in intensity of preventive care in maternal, and provider type in child curative care, showed that inequalities may have widened. In studies of more geographically and socially homogenous samples, fewer gradients were identified, signifying that in areas with comparable health service supply, future research will need to examine determinants of health-seeking beyond the traditionally used SEP indicators.

Overall, although ten studies examining socio-economic inequalities in health-seeking behaviours were identified, the body of research contains numerous gaps and the quality of available evidence is insufficient to draw a conclusive summary of the extent of gradients in Egypt. Future research needs to address gaps in the assessment of the various dimensions of maternal and child health-seeking behaviours, while carefully defining constructs underlying SEP indicators and correctly modelling this association in statistical analyses. This understanding will be crucial in designing and prioritising interventions to equitably improve maternal and child health outcomes in Egypt.[25]

Supporting Information

Table S1 PRISMA guidelines checklist.
(DOCX)

Author Contributions

Conceived and designed the experiments: LB OMRC GBP. Analyzed the data: LB OMRC GBP. Wrote the paper: LB OMRC GBP.

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10.2 Appendix B. LSHTM ethics application and approval

London School of Hygiene & Tropical Medicine **E1**
Keppel Street, London WC1E 7HT Oct 2011

Observational/Interventions Research Ethics Committee
Application to conduct a study involving human participants

Please ensure you download and complete the latest version of this form from the intranet:
http://intra.lshtm.ac.uk/management/committees/ethics/

This form should be completed and emailed along with all relevant attachments to ethics@lshtm.ac.uk. Attachments should be appended as a single file.

For use of Ethics Committee only	Application No.	Date received
	Response deadline	Date approval notification

Title of Project: **Socio-demographic determinants of health-seeking behaviour in Egypt and other middle-income countries (PhD dissertation)**	
Name of Chief Investigator (CI) (and institution if not LSHTM)	Lenka Benova
Appointment Held (or Research student) Department/ Faculty	Research Degree Student
LSHTM lead investigator *(if different from above)*	
LSHTM contact for correspondence *(if different from above)*	
Other personnel involved	
If Research student: Name, electronic signature and approval of Supervisor (or attach email approval)	Dr. George B. Ploubidis

Definition of interventions study for LSHTM review purposes: Interventional studies include all trials based on random allocation of interventions and also non-randomised interventions where participants or groups of participants are given treatments (of whatever nature) that they would not otherwise be receiving in the ordinary course of events and which are allocated by the investigators.		
Is this an intervention study?		
	NO	

Fastrack: Applications in the following categories will be dealt with by Chair's Action)		
Is this a DrPH Professional attachment?		
	NO	
Is this study using anonymised and unlinkable secondary datasets only	**YES**	
Has this study received NRES (NHS) approval? *(Approval to be attached)*		
	NO	
Is the CI of the main study based at another UK institution and has obtained ethics approval from their University Ethics Committee? *(Approval to be attached.)*		
	NO	

Checklist for submission

Please ensure you submit this application form electronically along with the relevant supporting documents listed below to ethics@lshtm.ac.uk . No hard copies are required.

Supporting documents should contain version numbers/dates where relevant, and all should be submitted within a single electronic file (separate to the application).

Please indicate supporting documents submitted with the application in the table below.

Document **(* provision is mandatory for all studies; **provision is mandatory for interventional studies)**	**Attached Y/N or n/a**	**Version number/date**
Application for ethical approval*	Y	Oct 24, 2012
Protocol/amendments (including data collection forms, questionnaires)*		
Informed consent forms/ updates and Information sheet/Written information to subjects *	Y	Oct 16, 2012
Investigators' CVs*	Y	Sept 2012
Sponsor letter**		
Available safety information for interventional studies**		
Subject recruitment procedures (eg advertisements)		
Investigator's brochure/Summary of product characteristics		
Information about payments/compensation to be provided to participants		
NRES (NHS)/other University ethical approval (if obtained)		
Local approval letter(s) (if obtained)	Y (2 documents)	Oct 24, 2012
Electronic signature or email approval of Supervisor (Research Degree students only)	Y	Oct 21, 2012
Written statement from company producing or providing any drug/appliance that it agrees to abide by the guidelines on compensation for non-negligent injury of the Association of the British Pharmaceutical Industry (ABPI)		

CIs/PIs must retain a copy of the approved version of this application and supporting documentation as part of their own research records in line with good practice. The Ethics Administrator will retain final copies on file for a period in accordance with School and other relevant record keeping requirements.

Please note: LSHTM risk assessment procedures are set out at http://intra.lshtm.ac.uk/safety/ (Travel Safety). All necessary procedures must be completed for all staff before fieldwork commences.

1.	Give an outline of the proposed project. Sufficient detail of the protocol must be given to allow the Committee to make an informed decision without reference to other documents. (Additional material should only be attached if considered absolutely necessary). *Max 300 words* **ATTACH FULL PROTOCOL TO THE ELECTRONIC SUBMISSION**
Answer: Expand box to fit	This dissertation seeks to fill some of the gaps in evidence of socio-economic gradient in health-seeking behaviour, taking Egypt as a case study. Based on lack of existing evidence in a systematic literature review in Egypt, it will assess the strength of association between four 'traditional' SEP dimensions (education, employment, dwelling characteristics and asset ownership) within multiple steps of four maternal and child health-seeking behaviours before examining whether these measures are useful as determinants of health-seeking behaviour within the strata of the poor. It is hypothesised that the addition of a fifth dimension capturing resourcefulness will improve the predictive power of the SEP measure among the poor, and this 'innovative' SEP measurement will also be applied to the nationally representative sample. The measure will be applied in a multi-level model of 38 middle-income countries to assess whether macro-level indicators predict health-seeking behaviour, and if so, whether this effect is direct or mediated through individual SEP. Latent variable modelling is proposed as a statistical method to construct unobserved measures of both traditional and innovative SEP. This quantitative study will use only secondary data sources: nationally representative studies (such as DHS, MICS) from 38 middle income countries and a dataset of the rural poor in Upper Egypt. This dataset, collected in 2010-2011, was obtained from The Social Research Center at the American University in Cairo. This institution holds an IRB approval for the data collection (available). Information about the dataset: The data was collected between December 2010 and January 2011 as a baseline for a pilot CCT program targeting the poorest villages in the poorest governorates in Egypt. Assiut and Sohag were selected as the two governorates with the highest rates of poverty nationally and within these governorates, 65 of the poorest villages were selected based on an assessment of deprivation. All 44,213 families that applied for the program were visited by social workers, who conducted an eligibility questionnaire using a targeting formula developed by the Ministry of Social Solidarity (MOSS).The 41,911 families who fulfilled the basic criteria for application were the target population of this survey from which the sample was drawn according to poverty level and intervention phase. According to the MOSS targeting formula, 32% of these eligible families were extremely poor, 29% near-poor and 39% non-poor. The target sample size of 6,000 families was stratified by governorate and poverty level, with a focus on the extreme poor. From the 6,000 families targeted by the survey, 5825 valid questionnaires were returned (97.1% response rate). For the purposes of this study, the 4,837 households living under the poverty line (very poor and near-poor) will be included in the analysis.
2.	State the intended value of the project. If this project or a similar one has been done before what is the value of repeating it? Give details of overviews and/or information on the Cochrane database. *Max 300 words* *This area is of increasing importance – please ensure you give a full response.*
	Beyond the initial gradient in healthcare utilization, there is a limited understanding of which additional determinants on the individual, household and country level may be associated with progression through the various steps in health-seeking behaviours in the context of middle-income countries, where modern health care is available, but a sizeable proportion of the population lives in poverty. Whereas among the stratum of the poor, any single measure of SEP will be limited as a determinant in the association with health-seeking behaviour, within the whole population a choice of one SEP indicator over another may alter findings about the existence and extent of a socio-economic gradient. This study seeks to contribute to the research on health inequalities by using Egypt as a case study of a middle-income country to develop a composite measure of traditional SEP indicators as well as innovative measures capturing resourcefulness. The use of a nationally representative survey in conjunction with a sample or the rural poor (Egypt) is crucial to investigating the determinants of health-seeking behaviour in Egypt.

3.	Specify numbers, with scientific justification for sample size, age, gender, source and method of recruiting participants for the study. *Max 300 words*
	Analysis of already existing datasets.
4.	State the personal experience of the applicant and of senior collaborators in the study in the field concerned, and their contribution to the study.
	Analysis of already existing datasets. I worked at the SRC between 2008-2010 on the project, helping design the questionnaire that resulted in this dataset. Although I was not directly involved in the fieldwork I helped with cleaning the dataset between November 2011 and May 2012.
5.	State the likely duration of the project, and where it will be undertaken.
	The analysis of datasets will take approximately 2 years, and will be conducted at the LSHTM.
6.	Specify the procedures, including interviews, involving human participants with brief details of actual methods. *Max 500 words*
	Analysis of anonymized datasets only, no interaction with human participants.
7.	State the potential discomfort, distress or hazards that research participants may be exposed to (these may be physical, biological and/or psychological). What precautions are being taken to control and modify these? Include information on hazardous substances that will be used or produced, and the steps being taken to reduce risks.
	None.
8. a)	Does the project involve pre-marketing use of a drug/appliance or a new use for a marketed product?
	NO
b)	Does the company producing or providing any drug/appliance (whether pre-marketed, new use for marketed product or licensed use of marketed product) agree to abide by the guidelines on compensation for non-negligent injury of the Association of the British Pharmaceutical Industry (ABPI)? If YES, a written statement from the company to this effect should be attached.
	NO
9.	Will payments be made to participants? These should usually not be for more than travelling expenses and/or loss of earnings and must not represent an inducement to take part. If YES give details and justification. Please supply copies of information about payments/compensation that will be provided to participants
	NO
10.	Specify how confidentiality will be maintained with respect to the data collected. When small numbers are involved, indicate how possible identification of individuals will be avoided.
	Analysis of anonymized datasets only. No geographic location variables beyond district level available in Upper Egypt dataset. In results tables no less than 6 individuals per cell in any table will be presented.
11. a)	State the manner in which consent will be obtained. (**Note** the information sheet and consent form must be electronically appended and submitted with this application). Written consent is normally required. When this is not possible, a detailed explanation of the reasons should be given and a record of those agreeing kept. (see LSHTM SOP on Informed Consent for Research - LSHTM/SOP/014 http://intra.lshtm.ac.uk/trials/sops/sopsinpdf/sop_014_consent.pdf - although aimed at clinical trials the principles apply to all studies)

	If research is on human tissue samples, investigators must refer to guidance notes at http://intra.lshtm.ac.uk/support/research/humantissueact.html If any photographs are to be taken, whether for teaching or research purposes, ensure that the participant's consent to their use has been given in line with the provisions in *British Medical Journal, 1998, **316**, 1009-1011.*
	Not applicable.
b)	Specify whether any subjects will be recruited from vulnerable groups? Please give details (This includes pregnant women, foetuses and neonates, children, prisoners, individuals with mental disability, individuals with learning difficulties, unconscious or severely ill, staff or students of LSHTM, other)
	Not applicable.
c)	State the manner in which consent will be obtained from subjects recruited from vulnerable groups if this is not clear from 11a above (i.e. additional measures being put in place for these subjects?). (**Note** the information sheet and consent form must be electronically appended and submitted with this application)
	Not applicable.
12.	State what medical supervision is available and its location in relation to the participants.
	Not applicable.
13.	Will equivalent service or support to participants be available after the study ends? If NO, give details and describe steps to minimise loss of service or support.
	Not applicable.
14. a)	For interventional trials (see definition on cover) Has, or will, the study be registered before the enrolment of the first participant on a publically accessible database? See http://www.who.int/ictrp/en/ for further information. *(A non-compulsory registry for observational studies in pharmacoepidemiology is available at http://www.encepp.eu/encepp_studies/index.html).*
	Not applicable.
b)	Does the trial comply with Good Clinical Practice (GCP)? If no, explain why.
	Not applicable.
c)	For clinical trials of medicines in the UK or EU please give details of CTA (Certificate of Clinical Trial Authorization).
	Not applicable.
d)	Is there a Data Safety Monitoring Board (DSMB) in place?
	Not applicable.
15.	If the aim of the study is to improve treatment or management indicate how successful treatment would be continued or expanded.
	Not applicable.
16.	Does this study involve the taking of blood samples and/or any other tissue?
	NO
17. a)	If YES Please list samples which will be taken.
b)	Please confirm that you have undertaken the on-line training programme available at http://intra.lshtm.ac.uk/support/research/humantissueact.html and that you will ensure that any staff involved in the procedures for taking consent will also have undertaken an agreed training programme.
	Not applicable.
c)	If samples are taken overseas, will the samples be brought back to LSHTM at any time?
	Not applicable.
18. a)	Where the research is to take place overseas, the Principal Investigator **must** seek ethical approval, through his/her overseas collaborators, in the country(s) concerned. Approval from the LSHTM Committee is dependent on local approval having been received. Please list the countries where research is being undertaken and arrangements being made

	to obtain local ethical and/or regulatory approval. Please electronically append copies of local approval letter(s) where this has already been obtained.
	Egypt, The American University in Cairo. Attached.
b)	Where the research is taking place in the UK, please list other UK Committees from which approval is being sought.
	Not applicable.
20.	Please give details of the funder and whether the funder sent the proposal out to Peer Review
	Not applicable.

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Observational / Interventions Research Ethics Committee

Lenka Benova
Research Degree Student
DPH/EPH
LSHTM

26 October 2012

Dear Dr Benova,

Study Title: **Socio-demographic determinants of health-seeking behaviour in Egypt and other middle-income countries (PhD dissertation)**

LSHTM ethics ref: **6300**

Thank you for your application of 24 October 2012 for the above research, which has now been considered by the Observational Committee via Chair's Action.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Conditions of the favourable opinion

Approval is dependent on local ethical approval having been received, where relevant.

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
LSHTM ethics application	n/a	24/10/2012
Information Sheet and Consent form		16/10/2012

After ethical review

Any subsequent changes to the application must be submitted to the Committee via an E2 amendment form. All studies are also required to notify the ethics committee of any serious adverse events which occur during the project via form E4. At the end of the study, please notify the committee via form E5.

Yours sincerely,

Professor Andrew J Hall
Chair
ethics@lshtm.ac.uk
http://intra.lshtm.ac.uk/management/committees/ethics/

10.3 Appendix C. Maternal DHS paper (Chapter 5)

Benova et al. BMC Health Services Research (2015) 15:1
DOI 10.1186/s12913-014-0652-8

BMC Health Services Research

RESEARCH ARTICLE Open Access

A mediation approach to understanding socio-economic inequalities in maternal health-seeking behaviours in Egypt

Lenka Benova[1*], Oona MR Campbell[1] and George B Ploubidis[1,2]

Abstract

Background: The levels and origins of socio-economic inequalities in health-seeking behaviours in Egypt are poorly understood. This paper assesses the levels of health-seeking behaviours related to maternal care (antenatal care [ANC] and facility delivery) and their accumulation during pregnancy and childbirth. Secondly, it explores the mechanisms underlying the association between socio-economic position (SEP) and maternal health-seeking behaviours. Thirdly, it examines the effectiveness of targeting of free public ANC and delivery care.

Methods: Data from the 2008 Demographic and Health Survey were used to capture two latent constructs of SEP: individual socio-cultural capital and household-level economic capital. These variables were entered into an adjusted mediation model, predicting twelve dimensions of maternal health-seeking; including any ANC, private ANC, first ANC visit in first trimester, regular ANC (four or more visits during pregnancy), facility delivery, and private delivery. ANC and delivery care costs were examined separately by provider type (public or private).

Results: While 74.2% of women with a birth in the 5-year recall period obtained any ANC and 72.4% delivered in a facility, only 48.8% obtained the complete maternal care package (timely and regular facility-based ANC as well as facility delivery) for their most recent live birth. Both socio-cultural capital and economic capital were independently positively associated with receiving any ANC and delivering in a facility. The strongest direct effect of socio-cultural capital was seen in models predicting private provider use of both ANC and delivery. Despite substantial proportions of women using public providers reporting receipt of free care (ANC: 38%, delivery: 24%), this free-of-charge public care was not effectively targeted to women with lowest economic resources.

Conclusions: Socio-cultural capital is the primary mechanism leading to inequalities in maternal health-seeking in Egypt. Future studies should therefore examine the objective and perceived quality of care from different types of providers. Improvements in the targeting of free public care could help reduce the existing SEP-based inequalities in maternal care coverage in the short term.

Keywords: Maternal health, Egypt, Socio-economic inequalities, Antenatal care, Facility delivery, Mediation analysis, Health-seeking behaviour, Care utilisation

Background

Health-seeking behaviours comprise one of the direct pathways leading to the widely reported association between socio-economic position (SEP) and health outcomes [1]. Understanding the mechanisms underlying this association is crucial to devising effective interventions to reduce avoidable and unfair inequalities in health outcomes. Inequities in the coverage of maternal care interventions have gained prominence in light of Millennium Development Goal efforts to reduce maternal and neonatal mortality by 2015 and beyond [2]. In addition to deaths, maternal near-miss events and other complications resulting in morbidity and long-term disability also carry devastating effects on the lives of women, children and families in the form of physical, psychological and socio-economic sequelae [3-5]. Antenatal care (ANC) and

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delivery care prevent maternal and perinatal deaths [6], but their coverage relies on numerous complex factors such as availability, quality and cost of care, as well as their utilisation by women.

Egypt witnessed large decreases in maternal mortality in the last two decades; a decrease from 174 to 84 per 100,000 live births between 1992–3 and 2000 [7] and a further decline to 66 by 2010 [8]. This reduction was most likely achieved through a combination of increasing ANC coverage, skilled birth attendance, improved quality of care, access to emergency obstetric care and fertility-reducing socio-economic development, in particular women's education [9]. Yet, in the five years before 2008, 78% of births to women with complete secondary or higher education were preceded by four or more ANC visits, but only 45% of births among women with no education were [10]. Physical access does not appear to present barriers to accessing care as 95% of Egypt's population live within 5 km from the nearest health facility [11] and only 4% of maternal deaths in the 2000 maternal mortality survey were classified as avoidable due to long distance to reach a hospital [7]. However, the existence of health care facilities may not necessarily translate into care which is available, acceptable, affordable and good quality. Substandard care and referral delays were implicated as the second most important preventable causes of maternal mortality in 2000 [7,12]. The proportion of facility deliveries occurring in public facilities has steadily declined from 63% in 1992 to 27% in 2008 [10]. This trend toward increasing private care utilisation may be a result of perceived and/or real quality of care deficits in the public sector [13].

Socio-economic resources are well-established determinants of maternal care utilisation in low and middle-income countries [14,15]. In Egypt, important gaps in the understanding of the extent of socio-economic inequalities in maternal health-seeking behaviours remain [16]. Specifically, no study has presented an adjusted analysis of the association between SEP and maternal health-seeking behaviour on a nationally-representative sample. Each separate dimension of maternal health-seeking behaviour (e.g., timing, intensity and costs of care) may exhibit different direction and magnitude of association with SEP. A detailed understanding of the association between SEP and the separate dimensions of health-seeking behaviour is required.

This study uses the most recent nationally-representative survey Demographic and Health Survey (DHS) conducted in Egypt in 2008 to address its three objectives. Firstly, we aim to assess the levels of health-seeking behaviours related to maternal care and their accumulation throughout the process of health-seeking leading toward receipt of the complete maternal care package. Understanding whether the current inequalities in maternal health-seeking behaviours are a result of knowledge-related preferences or differences in access to financial resources is essential to designing effective interventions aimed at their elimination. Therefore, our second objective involved exploring the mechanisms underlying the association between SEP and maternal health-seeking behaviours. For this purpose, latent variables capturing the socio-cultural capital and economic capital aspects of SEP were constructed. We specified an adjusted mediation model to assess the direct, indirect (mediated by economic capital) and total (direct plus indirect) effects of socio-cultural capital on maternal health-seeking behaviours [17,18]. This innovative approach allowed not only a quantification of the association between the two dimensions of SEP and health-seeking behaviour outcomes in adjusted analysis, but also an assessment of their relative importance as drivers of inequalities. Lastly, we examine the effectiveness of targeting of free public ANC and free public delivery care.

Methods

Study sample

The analysis is based on a nationally-representative survey of ever-married women aged 15–49 from the 2008 Egypt DHS. To examine health-seeking behaviours related to maternal care, we assessed behaviours surrounding the most recent birth among women who reported having given birth in the five years preceding the survey. We analysed costs of care among the subsample of women whose most recent birth occurred in the twelve months prior to survey to limit the need for women to recall costs over longer periods of time. The average annual inflation rate in consumer prices in the period between 2003 and 2007 was 7.5% [19].

Ethics

The collection of the DHS data was approved by local authorities in Egypt; respondents' informed consent was sought. This secondary analysis of anonymised data was approved by the Research Ethics Committee of the London School of Hygiene and Tropical Medicine, UK.

Measures of SEP

Socio-cultural capital

Education and literacy capture knowledge, ability to access new information, cognitive skills, previous exposure to authority, ability to interact with modern institutions such as healthcare providers, and have been linked to effective negotiation within familial power structures [20-23]. The education level of other decision-making members of the household influence health-seeking decisions through awareness of the benefits of medical assistance during pregnancy and support in seeking care

[24]. Employment status captures the utilisation of attained education and exposure to wider social networks through workplace interactions. The latent measure of socio-cultural capital was based on woman's and her husband's education (continuous variable reflecting number of years of education) and woman's literacy (illiterate, reads/writes with difficulty or reads/writes easily). Husband's occupational category (not employed, unskilled manual, skilled manual, services, agriculturally employed, agriculturally self-employed, sales, clerical and professional) was used. A binary variable captured the working status of the female respondents, as the large majority (87.1%) reported not to be working. High scores on the latent variable represented higher socio-cultural capital.

Economic capital

Household-level material resources available to meet the direct and indirect costs of care were captured by the economic capital latent variable [25]. This construct would ideally be captured by measures such as income, consumption or expenditure. However, the collection and post-processing of such measures is resource-intensive and requires sophisticated econometric techniques. The DHS wealth index provides a more stable measurement of household-level resources than consumption expenditure [26], although the underlying constructs may not coincide [27]. A household wealth index score based on principal component analysis of 79 separate household-level variables was constructed in the DHS. In order to be able to replicate the current analysis on other datasets collected in Egypt with fewer available variables, we constructed a simpler variable to reflect the relative distribution of accumulated resources among households in which women who have had a birth in the five-year recall period resided. Its ten variables consisted of binary descriptive characteristics of the current living residence: utilities (water piped into dwelling, flush toilet), household ownership of assets (fridge, car, mobile, colour TV, water heater, automatic washing machine), ownership of a bank account, and level of crowding. Crowding was calculated as the number of household members per bedroom, and dichotomized as being above or below the median level (1.5 members per bedroom) within the sample of women. High scores on the latent variable index of economic capital represented wealthier households.

Health-seeking behaviour outcomes

Antenatal care

Seven dimensions of ANC utilisation for the most recent pregnancy were assessed (Figure 1). A binary variable indicated whether the woman received any facility-based ANC during the pregnancy. If ANC was utilised, binary variables described its timeliness (whether first ANC visit occurred in first trimester of pregnancy), intensity (four or more ANC visits were received during pregnancy), and the type of provider used (public or private). The definition of private provider included any facility-based non-public providers, such as private hospitals, clinics, doctors, the Egyptian Family Planning Association, the Clinical Services Improvement project, and other non-governmental organisation/private providers. Only 2.1% of women who used ANC reported receiving care from a combination of public and private providers; we grouped women who used both public and private providers with those who solely used private providers.

Delivery care

We used five health-seeking behaviours to describe women's utilisation of delivery care (Figure 1). Firstly, a binary variable captured whether the most recent delivery in the five-year recall period occurred in a health facility. Among the subset of women with facility deliveries, we examined the use of private providers. A binary categorisation of private providers was constructed, combining all non-public sector providers (private hospitals/clinics, private doctor's offices and other private medical facilities, including non-governmental organisations).

Cost of care

The analysis of price of antenatal and delivery care was limited to births occurring in the 12 month period before survey. Among women who used public providers, we analysed the binary outcome capturing whether this care was obtained free of charge. Among paying users of public services and women who used private providers, we analysed the amount paid for care (Figure 1). Specifically, women were asked whether they paid for ANC services (excluding laboratory or medication costs) separately during each visit, on a one-time basis, or received ANC for free. Among paying ANC users, we created a variable capturing the per-visit cost of ANC. In order to arrive at the per-visit cost among women who incurred one-time payments, the total ANC expenditure was divided by the number of ANC visits during pregnancy. For women who reported paying for each ANC visit separately, the amount reported paid for the last ANC visit during pregnancy was used. The cost of delivery service (excluding laboratory and medication expenses), reported by women with a facility-based birth was analysed. We constructed a binary variable capturing whether delivery care was received for free or not. Among women who reported paying for delivery care, a continuous variable captured the amount paid. The resulting continuous variables reflecting price of ANC and delivery care in Egyptian pounds (EGP), 1USD = 5.5 EGP in 2008), which were estimated separately by provider type.

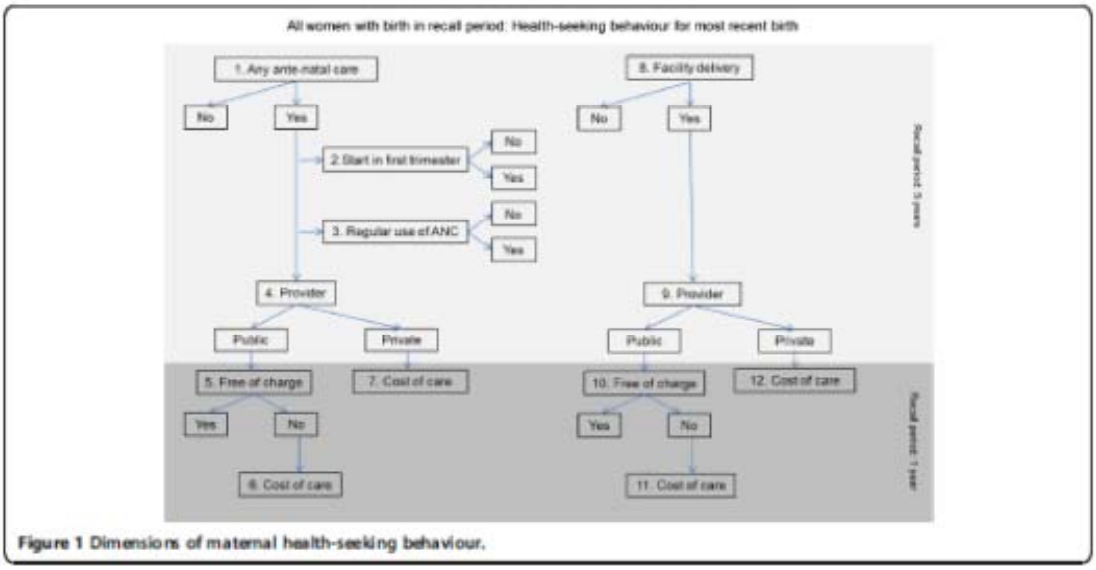


Figure 1 Dimensions of maternal health-seeking behaviour.

Complete maternal care package

For the purposes of analysing the receipt of the basic elements of maternal care, we defined a complete maternal care package as the receipt of timely (first visit in the first trimester of pregnancy) and regular (four or more ANC visits during pregnancy) facility-based ANC and facility delivery. Women who did not receive any or all of these three care elements were considered not to have received the complete package. This binary classification was made regardless of whether such care was obtained from public or private providers and irrespective of the cost incurred for this care.

Confounders

We identified *a priori* confounders of the association between socio-cultural capital, economic capital and maternal health-seeking behaviours [14], including woman's age group at the time of the most recent birth, parity group and whether pregnancy under analysis was intended or not [28]. Elements of availability of health services were captured in the residence variable (urban or rural) and whether respondent had unmet need for contraception at the time of the survey [29]. We created a binary variable for female head of household to capture the extent of the respondent's autonomous decision-making. Additional variables related to maternal care were also used in the analysis of subsequent health-seeking outcomes, including the use of any ANC, use of regular ANC, use of private ANC, receipt of information about delivery complications during pregnancy, and delivery by caesarean section.

Statistical analysis

Latent variable modelling is an approach to quantify unobservable constructs by utilising common variance among observed indicators. Variance that is not common, including random error, is disregarded from the latent summary. The aim is to reduce the dimensionality of the observed data, but to retain a good representation within the latent variable identified [30,31]. Latent variables capturing socio-cultural and economic capital were constructed in Mplus/v.7.11 using the Weighted Least Squares, Mean and Variance adjusted (WLSMV) estimator. Factor loadings of each observed variable represent the association between this indicator and the underlying construct. Proportion of missing data in the observed variables in both latent constructs was minimal, and all observations were included. Model fit was assessed with the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI) and the Root Mean Square Error of Approximation (RMSEA). The latent scores were standardised to a mean of zero and standard deviation of one.

Figure 2 shows the conceptual framework of the analysis in which socio-cultural capital can be directly or indirectly (through economic capital) associated with the outcomes. Continuous latent scores for both variables were entered in the mediation model, in order to jointly estimate their associations. The direct effects of both measures of SEP on binary outcomes was modelled in logistic regression and odds ratio was the main effect estimate. The total effect of socio-cultural capital (sum of its direct and indirect effects) on binary outcomes is expressed as the sum of changes in the probability of outcome ($\Sigma\Delta p$).

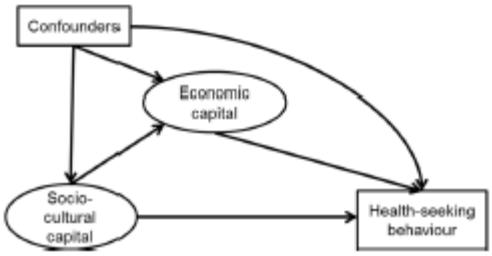


Figure 2 Conceptual path diagram of the structural model.

We estimated the mean price of ANC and delivery care by provider type and assessed the effectiveness of free public care targeting by comparing the mean socio-cultural and economic capital scores between women who received ANC or delivery care free of charge at public facilities with those who used these public services but paid for care. The extent of SEP inequalities accumulated throughout the health-seeking process for the most recent birth was estimated by comparing the mean SEP scores of women who received the complete maternal care package with those who received no maternal care. Inequalities in this multidimensional outcome and in samples used for assessment of targeting were examined in the subsample of women who delivered in the twelve month period preceding the survey, using the t-test.

We accounted for the complex survey sampling (clustering, stratification and weights) by using the *svyset* command in Stata in the descriptive overview of the sample and in analysis of targeting and multidimensional outcomes. The Stata *medeff* command was used for mediation analysis, incorporating robust standard errors adjusting for clustering and sampling weights [32]. The proportion of missing data in the majority of the outcome variables was minimal and we utilised complete case analysis in the mediation analysis.

Results

The latent measurement models for both SEP constructs had an acceptable fit to the data; the RMSEA level was ≤0.05 and the CFI/TFI ≥0.972 (Additional file 1). The median standardised socio-cultural capital score was 0.139 (inter-quartile range [IQR]: −0.575 to 0.501) and median economic capital score was −0.058 (IQR: −0.380 to 0.491). An observation with a median socio-cultural capital score was described as a woman with six years of education, with difficulty reading and writing, not currently in employment, with a husband self-employed in agriculture who achieved 12 years of education. The median economic capital score described a household which owned a fridge, a mobile phone, a colour TV, had a piped water connection, but did not own a car, a water heater, an automatic washing machine, a flush toilet in the dwelling, a bank account, and in which crowding was less than the national median of 1.5 persons per bedroom.

Table 1 displays the demographic and socio-economic characteristics of the samples analysed in this study. The differences between the overall sample of women with a birth in five years preceding the survey (sample A) and the subsample of women who delivered in the 12-month period before the survey (sample B) included a younger age distribution in sample B, as well as lower parity, lower proportion of unwanted pregnancies, higher proportion of deliveries by caesarean section, lower proportion of women with female head of household status and higher mean socio-cultural capital score. Among ANC users, women with non-missing cost information did not differ from the women with missing price of care data in the distribution of demographic, pregnancy-related or SEP factors. The proportion of missing data in price paid for care did not differ between users of private and public providers in ANC or delivery samples (X^2 test p-value 0.786 and 0.258, respectively).

Levels of the twelve maternal health-seeking behaviours are described in Table 2. Among women with a birth in the five years preceding the survey, 74.2% reported having received ANC for their most recent birth. Within users of ANC, 82.5% received ANC starting in the first trimester, 90.6% received regular ANC, and 76.6% visited a private provider. In terms of delivery care, 72.4% of women reported having delivered in a health facility, 63.0% of them in a private facility. Figure 3 shows that when the combination of ANC and delivery care is assessed, 48.4% (95%CI 46.7%-50.0%) of women with a birth in five years preceding the survey obtained the complete maternal care package for their most recent birth.

Among women who had a birth in the twelve months before the survey, 38.1% of those attending public providers reported receiving free ANC; 24.1% of women who delivered in a public facility reported receiving care free of charge (Table 2). The mean reported cost of a paid ANC visit was 2.0 EGP among user of public and 18.4 EGP among users of private providers. The mean cost of public delivery services was 97 EGP, differing between caesarean section deliveries (203 EGP) and normal deliveries (64 EGP). The mean price of private facility delivery was 490 EGP; 889 EGP for a caesarean section delivery and 300 EGP for a normal delivery.

Mediation analysis

The result of adjusted analysis of the association between the two latent variables and any ANC use (Table 3) shows that a one unit increase in socio-cultural capital

Table 1 Distribution of demographic, socio-economic and delivery-related variables in study samples

Characteristics	Sample of women	All women with live birth in recall period		ANC users			Facility delivery users		
				All		ANC cost available	All		Delivery cost available
	Recall period	*5 years*	*1 year*	*5 years*	*1 year*	*1 year*	*5 years*	*1 year*	*1 year*
	Sample name	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*
	Sample size	*7,896*	*2,581*	*5,861*	*2,058*	*1,994*	*5,715*	*1,962*	*1,724*
Age group	14-19 (%)	9.2	10.9	9.4	10.8	10.7	9.3	11.0	10.9
	20-24	32.5	35.6	33.5	36.2	36.1	31.8	35.6	35.5
	25-29	30.6	29.8	31.1	30.4	30.4	31.2	30.0	29.9
	30-34	16.6	14.7	15.7	14.0	14.1	16.4	14.3	14.1
	35-39	8.7	7.5	8.2	7.3	7.3	8.9	7.7	8.0
	40-49	2.4	1.5	2.1	1.3	1.4	2.4	1.4	1.6
	X^2p value	*<0.001*			*0.824**			*0.750**	
Parity	1 (%)	26.6	34.0	30.6	37.4	37.3	30.6	38.4	37.9
	2	28.1	26.9	28.8	26.5	26.4	29.0	26.9	27.8
	3	21.6	19.8	21.2	19.2	19.4	21.2	19.1	18.9
	4 or more	23.7	19.3	19.4	16.9	16.9	19.2	15.6	15.4
	X^2p value	*<0.001*			*0.254**			*0.219**	
Household status	Female head (%)	78.0	73.6	79.3	74.5	74.6	79.7	74.7	73.9
	X^2p value	*<0.001*			*0.241**			*0.033**	
Desire for pregnancy	Unwanted (%)	15.3	14.0	13.7	12.1	12.3	13.7	12.3	12.8
	Wanted	84.7	86.0	86.3	87.9	87.7	86.3	87.7	87.8
	Missing	<0.1	<0.1	<0.1	0.0	<0.1	<0.1	0.0	<0.1
	X^2p value	*0.003*			*0.182**			*0.110**	
Need for contraception	Unmet (%)	12.2	12.7	11.3	11.8	11.8	11.4	12.7	12.8
	X^2p value	*0.428*			*0.811**			*0.695**	
Region	Urban (%)	38.2	37.4	43.8	41.8	41.5	45.3	43.0	43.6
	Rural	61.8	62.6	56.2	58.2	58.5	54.7	57.0	56.4
	X^2p value	*0.419*			*0.066**			*0.189**	
C-section delivery	Yes (%)	29.2	31.5	34.3	35.5	35.4	40.3	41.5	42.7
	X^2p value	*0.007*			*0.744**			*0.005**	
Socio-cultural capital	Mean	0.027	0.061	0.137	0.134	0.132	0.138	0.146	0.152
	(SE)	(0.0118)	(0.0158)	(0.0123)	(0.0166)	(0.0165)	(0.0128)	(0.0172)	(0.0178)
	T test p value	*0.001*			*0.155***			*0.142***	
Economic capital	Mean	0.064	0.063	0.177	0.148	0.145	0.198	0.175	0.177
	(SE)	(0.0133)	(0.0169)	(0.0139)	(0.0178)	(0.0172)	(0.0144)	(0.0184)	(0.0195)
	T test p value	*0.968*			*0.106***			*0.379***	

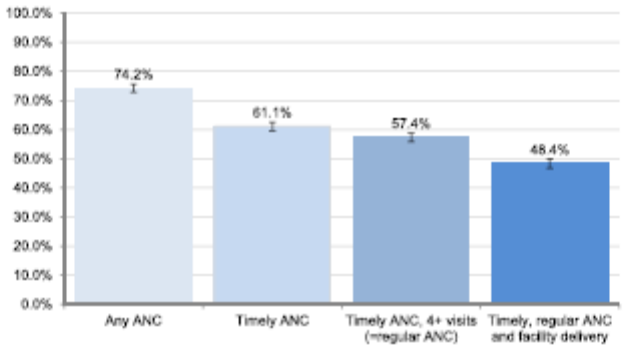
SE: standard error. Complex survey design (weighting, clustering and stratification) was accounted for in calculations of proportions and sample sizes reported.
*Testing the hypothesis that users of ANC/facility delivery services in the last year before survey who had missing data in the variable for cost of those services were drawn from the same population as users with available cost information.
**T test p value testing that the difference in mean SEP scores between samples of women is 0.

was associated with 1.55 higher odds of any ANC (95% CI 1.40-1.72) and with 1.79 higher odds of private ANC use (95%CI 1.57-2.04). Higher socio-cultural capital scores were marginally associated with higher odds of receiving ANC in the first trimester (OR = 1.13, p-value 0.096) and regular use of ANC (OR = 1.20, p-value 0.037). The total effect of socio-cultural capital on the four binary ANC outcomes was significant and positive, and the strength of the direct association between economic capital and these outcomes was larger than the direct association of socio-cultural capital. The associations between socio-cultural capital and any ANC use and socio-cultural capital and private ANC use were mainly the result of its direct effect (42% and 31% were

Table 2 Maternal health-seeking behaviours among ever-married women for most recent birth

Health-seeking behaviour outcome	Variable type	Samples and missing data				Distribution of outcome in analysed sample and 95% CI
		Eligible sample and recall period	Eligible sample (size)	Missing data (%)	Analysed sample (size)	
Antenatal care (ANC)						
1. **Used ANC**	Binary	All women with birth 5 years prior to survey	7,896	-	7,896	74.2% (72.8 - 75.6)
2. **ANC in 1st trimester of pregnancy**	Binary	All women with birth 5 years prior to survey who used any ANC	5,861	0.2	5,851	82.5% (81.3 - 83.7)
3. **Regular use of ANC (4+ visits)**	Binary	All women with birth 5 years prior to survey who used any ANC	5,861	0.9	5,798	90.6% (89.7 - 91.4)
4. **ANC from private provider**	Binary	All women with birth 5 years prior to survey who used any ANC	5,861	-	5,861	76.6% (74.9 - 78.1)
5. **Public provider: ANC free of charge**	Binary	All women with birth 1 year prior to survey who used public ANC	426	1.6	419	38.1% (32.7 - 43.7)
6. **Public provider: Cost of ANC (EGP)**	Continuous	All women with birth 1 year prior to survey who used public ANC and paid for care	259	-	259	GM 2.0 (1.7 - 2.3)
7. **Private provider: Cost of ANC (EGP)**	Continuous	All women with birth 1 year prior to survey who used private ANC and paid for care	1,633	3.6	1,575	GM 18.4 (17.8 – 19.1)
Delivery care						
8. **Delivered in a health facility**	Binary	All women with birth 5 years prior to survey	7,896	<0.1	7,893	72.4% (70.8 - 73.9)
9. **Used private delivery facility**	Binary	All women with birth 5 years prior to survey who delivered in a health facility	5,715	-	5,715	63.0% (61.1 - 64.9)
10. **Public provider: Delivery free of charge**	Binary	All women with birth 1 year prior to survey who delivered in a public health facility	700	12.7	611	24.1% (20.3 – 28.3)
11. **Public provider: Cost of delivery (EGP)**	Continuous	All women with birth 1 year prior to survey who delivered in a public health facility and paid for delivery	464	-	464	GM 96.6 (83.5 – 111.7)
12. **Private provider: Cost of delivery (EGP)**	Continuous	All women with birth 1 year prior to survey who delivered in a private health facility and paid for delivery	1,262	11.8	1,113	GM 489.8 (462.5 – 518.7)

Complex survey design was accounted for in calculations of proportions, means and confidence intervals. EGP: Egyptian pound 95%CI: 95% confidence interval GM: Geometric mean.



Timely ANC: received first ANC visit in first trimester of pregnancy. Regular ANC: Received 4 or more ANC visits during pregnancy.

Figure 3 Proportions of women with a birth in five years preceding the survey receiving elements of the complete maternal health package.

mediated by economic capital, respectively). On the other hand, the associations between socio-cultural capital and first trimester ANC use and socio-cultural capital and regular ANC use were largely mediated through economic capital (indirect effect accounted for 73% and 66% of the total, respectively). Both socio-cultural and economic capital strongly predicted facility use for delivery care. The direct effect of a one unit increase in socio-cultural capital was associated with 1.31 higher odds of delivering in a facility (95%CI 1.16-1.47) and with 1.51 higher odds of delivering in a private facility (95%CI 1.34-1.70). We estimated that economic capital mediated 52% of the total effect of socio-cultural capital on facility delivery and 35% of its effect on private facility use.

Table 3 also shows the associations between socio-economic and cultural capital and receiving public ANC and delivery services free of charge. Among women who received public ANC, a one unit increase in socio-cultural capital was associated with 2.08 higher odds of free ANC care (95%CI 1.39-3.10), but a one unit increase in economic capital halved the odds of free ANC care (OR = 0.56, 95%CI 0.32-0.97). None of its effect was therefore mediated by economic capital. Neither SEP measure was significantly associated with the odds of receiving free public delivery care; mediation analysis was therefore not applicable.

Figure 4 displays the mean levels of socio-economic capital and economic capital between various subsamples of women with a birth in the year prior to survey. Panels A and B show that the mean scores among women who received complete maternal care was significantly higher than the mean score of all women in this sample and higher than among women who did not receive any facility-based maternal services. Further, Panel C contrasts the mean scores of three subsamples of women according to ANC health-seeking behaviour outcomes. The mean socio-cultural and economic capital scores among women who received free public ANC were marginally lower than among all users of public ANC (p-values 0.052 and 0.029, respectively). However, non-users of ANC had significantly lower mean socio-cultural ($p < 0.001$) and economic ($p = 0.005$) capital scores compared to women who received free public ANC. Panel D shows that the data were consistent with no difference in the mean socio-cultural capital ($p = 0.983$) and economic capital ($p = 0.221$) scores between women who received free public delivery care and all women who received public delivery care. However, the mean socio-cultural capital and economic capital scores were significantly lower among women who did not deliver in a facility compared to those who received free public care (p-values 0.002 and <0.001, respectively).

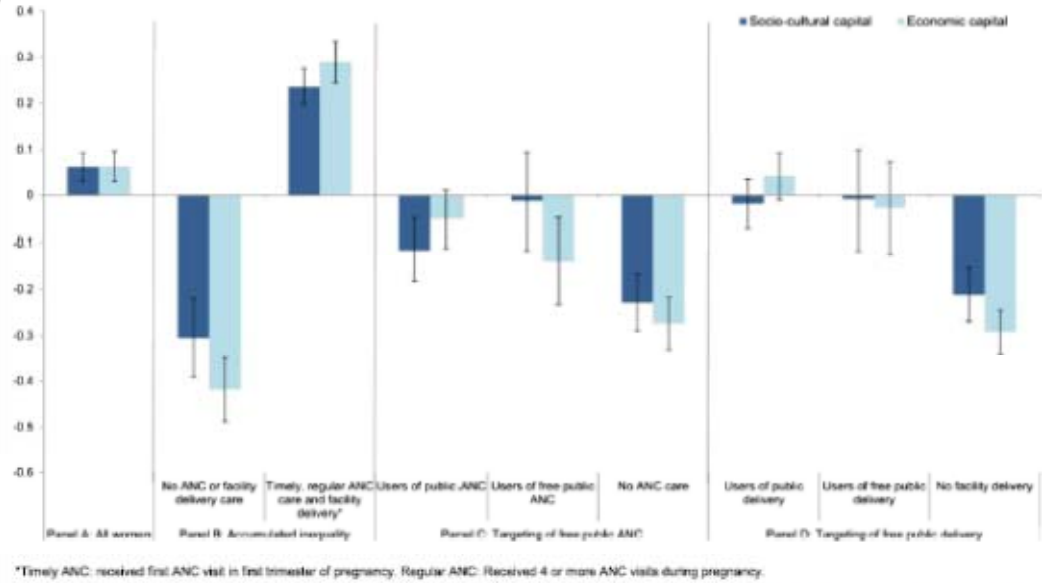
Discussion

Our findings showed that socio-economic position was a strong determinant of maternal health-seeking behaviours in Egypt. In adjusted models, both socio-cultural and economic capital scores were significantly positively associated with receiving ANC and delivering in a health facility. Socio-cultural capital was the main driver of private provider preference, but available economic resources largely determined the timeliness and intensity of such care. Women who received free public ANC or

Table 3 Adjusted effects of socio-cultural capital and economic capital on binary maternal health-seeking behaviours

Utilisation of maternal services	(1) Direct effect of socio-cultural capital	(2) Direct effect of economic capital	(3) Total effect of socio-cultural capital	(4) % of total effect of socio-cultural capital mediated by economic capital
	OR (95% CI)	*OR (95% CI)*	*ΣΔp (95% CI)*	*% (95% CI)*
Any ANC use[1]	1.55 (1.40 to 1.72)	2.18 (1.92 to 2.48)	0.10 (0.09 to 0.11)	42% (38% to 48%)
ANC in first trimester[1]	1.13 (0.98 to 1.30)	2.08 (1.75 to 2.46)	0.05 (0.04 to 0.07)	73% (57% to 100%)
Regular use of ANC[2]	1.20 (1.01 to 1.42)	2.31 (1.85 to 2.89)	0.03 (0.02 to 0.04)	66% (53% to 90%)
Private ANC use[1]	1.79 (1.57 to 2.04)	1.91 (1.61 to 2.26)	0.12 (0.10 to 0.13)	31% (27% to 35%)
Facility delivery use[3]	1.31 (1.16 to 1.47)	2.12 (1.84 to 2.45)	0.08 (0.06 to 0.09)	52% (44% to 65%)
Private delivery facility[4]	1.51 (1.34 to 1.70)	1.80 (1.55 to 2.11)	0.13 (0.11 to 0.15)	35% (30% to 42%)
Public ANC free of charge[5]*	2.08 (1.39 to 3.10)	0.56 (0.32 to 0.97)	0.12 (0.04 to 0.21)	0%
Public delivery free of charge[4]*	1.30 (0.88 to 1.90)	0.69 (0.43 to 1.10)	0.03 (−0.04 to 0.10)	not applicable

95%CI: 95% confidence interval. OR: Odds ratio associated with one unit increase in capital score.
ΣΔp: Total effect of socio-cultural capital was calculated as the sum of the changes in probability of outcome based on both indirect (mediated by economic capital) and direct effects.
*Free public care was assessed in subsample of women with a birth in the 12 month period preceding the survey.
[1]Adjusted for age group, parity, household status, pregnancy wanted, unmet need and region.
[2]Adjusted for age group, parity, household status, pregnancy wanted, unmet need, region, and private ANC provider use.
[3]Adjusted for age group, parity, household status, pregnancy wanted, unmet need, region, any ANC use, and information on delivery complications.
[4]Adjusted for age group, parity, household status, pregnancy wanted, unmet need, region, any ANC use, information on delivery complications, and delivery by c-section.
[5]Adjusted for age group, parity, household status, pregnancy wanted, unmet need, region, and regular ANC.



*Timely ANC: received first ANC visit in first trimester of pregnancy. Regular ANC: Received 4 or more ANC visits during pregnancy.

Figure 4 Socio-cultural and economic capital mean scores (95% confidence intervals) within subsamples of women who gave birth in the twelve month period preceding survey.

free public delivery care were not significantly poorer than all women using public care. However, women who did not receive ANC or delivery care had significantly lower mean socio-cultural capital and economic capital scores than women accessing free public care.

The average cost of a single ANC visit was approximately ten times higher in private compared to public facilities and the average cost of delivery services was five times higher in private compared to public facilities. A woman receiving the minimum recommended ANC care (four visits) and a caesarean section delivery would be expected to pay between 211 EGP (all care from public facilities) and 970 EGP (all care from public facilities) for these services; excluding laboratory charges, medications and other costs such as transportation, child-care and foregone income. In light of the 41.2% poverty rate in Egypt in 2008–2009 [33], it is not surprising that only half of women received the three components of the complete maternal care package, and that this multidimensional health-seeking outcome was strongly socio-economically patterned.

In order to capture the most recent patterns of health-seeking behaviour, we analysed the circumstances surrounding the most recent birth in the recall period. The overall response rate to the EDHS 2008 survey was high (98.8%). However, this analysis faced several limitations. The DHS collected information on the health-seeking behaviours surrounding women's most recent live birth in the recall period. Health-seeking behaviours of women whose most recent pregnancies resulted in a stillbirth are not represented in these data. The cross-sectional and observational design of this study limits our ability to assess causal relationships between SEP and health-seeking behaviours. In addition, the data were collected before the dramatic changes in socio-political situation in early 2011, which may have influenced the patterns of both supply and demand for care, thereby potentially limiting the generalisability of our findings [34].

The two latent SEP measures constructed and used in this study relied on observed self-reported variables, which are reliable and present lower risk of measurement error and recall bias compared to income, expenditure or consumption variables [35]. The DHS wealth index has been criticised due to inclusion of components, such as utilities or items dependent on utilities (i.e., electrical appliances), which are more prevalent in urban areas [36]. Our measure of economic capital faced similar issues. Another limitation of asset-based measures stems from inability of binary measures of ownership to capture potentially important variability in the quality of assets and their state of repair [37]. We attempted to minimise this potential source of error in our analysis by using the highest grade of asset (i.e., *colour* TV, *mobile* phone, *automatic* washing machine), but were not able to assess their functionality.

All measures of health-seeking behaviour analysed in this study were self-reported. Whereas we expect the report of the occurrence of a live birth in the recall period to be reliable, the health-seeking behaviour variables may be affected by measurement error and recall bias. The health-seeking behaviour variables (e.g., number of ANC visits, type of delivery facility) may be affected by measurement error, in particular recall bias and social desirability bias [38,39]. A study in rural China showed that validity of women's recall of ANC timing and components up to five years since the delivery showed high sensitivity (~90%) [39]. Women's self-report of the level of health facility utilised in delivery care carried high sensitivity and specificity in Mozambique. [40] The information about ANC was collected only about the most recent birth and although information about delivery circumstances of all births in the 5 year recall period are available, we chose to only assess both ANC and delivery health-seeking behaviours for the most recent pregnancy and delivery to minimise such error. However, the validity of women's recall of the various dimensions of maternal health-seeking has not been assessed in Egypt, and may be differentially biased according to the time that had elapsed since the events took place [41,42].

We conducted sensitivity analysis using skilled birth attendance instead of facility delivery as a delivery care outcome and obtained similar results (not shown). We attempted to reduce recall bias by limiting the analysis of price of care to births which occurred in the twelve months prior to survey. The costs of laboratory tests and medications during ANC and delivery care were not included in the analysis due to high level of missingness. Therefore, interpretation of such partial information about pregnancy care expenditures should be cautious.

The main strength of this study stems from including both socio-cultural and economic aspects of SEP in the mediation model predicting their association with various dimensions of maternal health-seeking behaviour. This approach allowed for the estimation of the total effect of socio-cultural capital as well as decomposition into its direct and indirect components. However, for this estimated model to be valid, there should be no unmeasured confounding in any part of Figure 2 [43]. While we attempted to identify and include all potential confounders, the presence of unmeasured confounding cannot be completely ruled out. Women's obstetric risk profile may be one such potential confounder, but the type of information (e.g. complications in previous deliveries, a complete history of assisted deliveries) which would allow the construction of such profile was not collected on the DHS. Instead, women's age group and parity were used as proxies. Indicators capturing the supply and quality of maternal care, while not available in the dataset, may have acted as effect modifiers or potential sources of unmeasured confounding. In sensitivity analyses of the effect of region of residence as a proxy for geographical availability of services, the data were consistent with no effect modification (results not shown).

Conclusions

Further improvements in maternal health in Egypt are highly dependent on increasing coverage of maternal interventions among the poorest and most disadvantaged segments of society [44]. To our knowledge, this is the first analysis of socio-economic inequalities in maternal health-seeking behaviours in Egypt employing a formally specified mediation framework. The results showed that socio-economic inequalities in the coverage of basic maternal health interventions exist. By analysing the effects of socio-cultural and economic resources separately, we provided insights into the mechanisms through which socio-economic position determines health-seeking behaviours. Effectiveness of free public care targeting must improve in order to reach the most socio-economically vulnerable women. In order to inform the design of effective interventions to reduce the remaining inequalities, future research should focus on quality of care and perceptions of different provider types. This approach would be particularly pertinent in light of the common occurrence of medical staff simultaneously practicing in both public and private sectors. Lastly, an exploration of other determinants of maternal care utilisation among socio-economically vulnerable women, such as their personal interaction with care providers, could help explore other enabling factors or barriers to accessing maternal care [45].

Additional file

Additional file 1: Descriptive characteristics of component variables in latent SEP measurements, among sample of women who gave birth in 5 year preceding survey (n = 7,896).

Abbreviations

ANC: Antenatal care; CFI: Comparative fit index; DHS: Demographic and health survey; EGP: Egyptian pound; RMSEA: Root mean square error of approximation; SEP: Socio-economic position; TLI: Tucker lewis index; WLSMV: Weighted least squares, mean and variance adjusted estimator.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

LB and GBP conceptualised the study. LB conducted the analysis and prepared the first draft of the manuscript. All authors contributed to the interpretation of the data and the preparation of the final manuscript. All authors read and approved the final manuscript.

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10.4 Appendix D. Maternal health-seeking questions (EDHS 2008)

Now I would like to ask you some questions about the health of all your children born in the last five years.

Antenatal care

Question number, wording and instructions to enumerator	Response category	Response options
507 Did you see anyone for antenatal care for this pregnancy? IF YES: Whom did you see? Anyone else? PROBE FOR THE TYPE OF PERSON AND RECORD ALL PERSONS SEEN.	HEALTH PROFESSIONAL OTHER PERSON NO ONE	Doctor Nurse/Midwife Daya Other (Specify) No one
508 Where did you receive antenatal care for this pregnancy? CIRCLE ALL MENTIONED	HOME GOVERNMENT NONGOVERNMENTAL PRIVATE MEDICAL OTHER NON MEDICAL	Your home Other home Urban hospital (general/district) Urban health unit Health office Rural hospital Rural health unit MCH center Other government (Specify) Egyptian FP Association CSI project Other NGO (Specify) Private hospital/clinic Private doctor Other private medical (Specify) Specify
509 How many times did you receive antenatal care during this pregnancy?		Number of times __ __ Don't know
510 How many months pregnant were you when you first received antenatal care for this pregnancy?		Months 0 __ Don't know
512 Were you charged a single fee for all of the antenatal visits you made before (child's name's) birth or did you pay separately for each visit?		Paid single fee for all visits Paid separate fee for each visit Both Free
513 (if single fee or both types paid) How much did you pay in total for all of your antenatal care visits during this pregnancy including all the consultations with the provider and any drugs or laboratory tests you had at (FACILITY)? 513A (if separate fees paid each visit) How much did you pay for your last antenatal care visit including the consultation with the provider and any drugs or laboratory tests you had at (FACILITY)?		Cost __ __ __ __ pounds Don't know

Delivery care

Question number, wording and instructions to enumerator	Response category (if used)	Response options
542 Who assisted with the delivery of (child's name)? Anyone else? PROBE FOR THE TYPE OF PERSON AND RECORD ALL PERSONS ASSISTING.	HEALTH PROFESSIONAL OTHER PERSON NO ONE	Doctor Nurse/Midwife Daya Other (Specify) No one
543 Where did you give birth to (child's name)?	HOME GOVERNMENT NONGOVERNMENTAL PRIVATE MEDICAL PRIVATE NON-MEDICAL	Your home Other home Urban hospital (general/district) Urban health unit Health office Rural hospital Rural health unit MCH center Other government (Specify) Egyptian FP Association CSI project Other NGO (Specify) Private hospital/clinic Private doctor Other private medical (Specify) Specify
545 Was (child's name) delivered by caesarean section?		Yes No
546 How much did you pay for care for (child's name) delivery?		Cost in pounds __ __ __ __ In kind Free Don't know

10.5 Appendix E. Child health-seeking questions (EDHS 2008)

Now I would like to ask you some questions about the health of all your children born in the last five years.

Diarrhoea-related questions

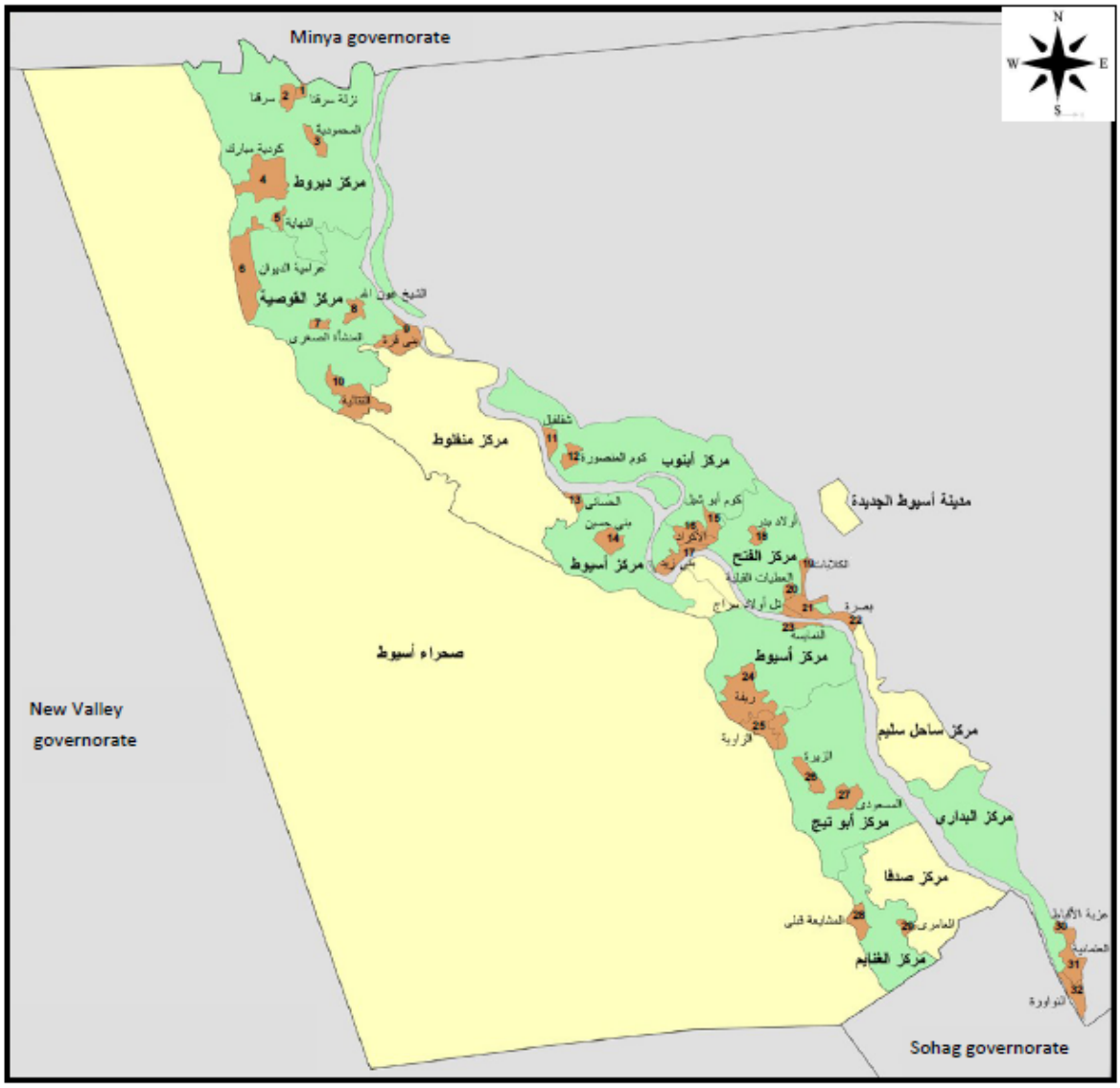
Question number, wording and instructions to enumerator	Response category (if used)	Response options
628 Has (child's name) had diarrhoea in the last 2 weeks?		Yes No Don't know
629 Was there any blood in the stool?		Yes No Don't know
632 Did you seek advice or treatment for the diarrhea from any source?		Yes No
633 Where did you seek advice or treatment? Anywhere else? RECORD ALL PLACES MENTIONED.	GOVERNMENT	Urban hospital (general/district) Urban health unit Health office Rural hospital Rural health unit MCH center Other government (Specify)
	NONGOVERNMENTAL	Egyptian FP Association CSI project Other NGO (Specify)
	PRIVATE MEDICAL	Private hospital/clinic Private doctor Pharmacy Other private medical (Specify)
	OTHER NON MEDICAL	Specify
636 How many days after the diarrhea began did you first seek advice or treatment for (child's name)? IF THE SAME DAY, RECORD '00'.		Days __ __

ARI-related questions

Question number, wording and instructions to enumerator	Response category (if used)	Response options
643 Has (child's name) had ill with a fever at any time in the last 2 weeks?		Yes No Don't know
644 Has (child's name) had an illness with a cough at any time in the last 2 weeks?		Yes No Don't know
645 When (NAME) had an illness with a cough, did he/she breathe faster than usual with short, rapid breaths or have difficulty breathing?		Yes No Don't know
646 Was the fast or difficult breathing due to a problem in the chest or to a blocked or runny nose?		Chest only Nose only Both Other Don't know
650 Did you seek advice or treatment for the illness from any source?		Yes No
651 Where did you seek advice or treatment? Anywhere else? RECORD ALL PLACES MENTIONED.	GOVERNMENT NONGOVERNMENTAL PRIVATE MEDICAL OTHER NON MEDICAL	Urban hospital (general/district) Urban health unit Health office Rural hospital Rural health unit MCH center Other government (Specify) Egyptian FP Association CSI project Other NGO (Specify) Private hospital/clinic Private doctor Pharmacy Other private medical (Specify) Specify
654 How many days after the illness began did you first seek advice or treatment for (child's name)? IF THE SAME DAY, RECORD '00'.		Days __ __

10.6 Appendix F. Maps and photos of Upper Egypt villages

Assiut governorate map



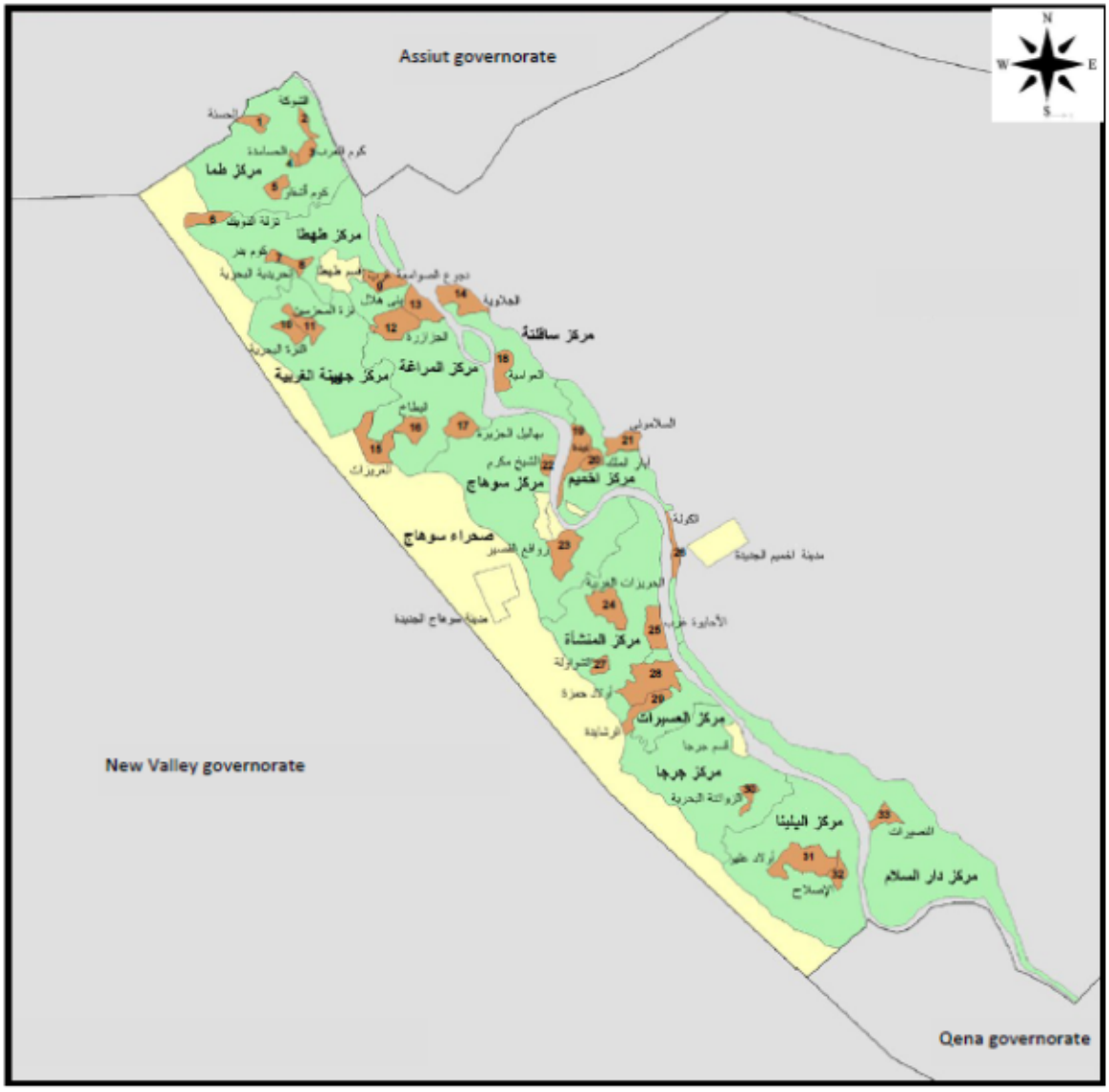
Legend:

Selected district (*markez*)

Selected village

1 Nazlet Sergena
2 Sergena
3 Al Mahmoodeya
4 Kodyet Mubarak
5 Al Nehaya
6 Arameyet el Diwan
7 Al Monshaa El Soghra
8 Al Sheik Awn Allah
9 Beni Gora
10 Al Tataleya
11 Shaqalqeel
12 Kom El Mansoura
13 Al Hassani
14 Beni Hussein
15 Kom Abo Sheel
16 Al Akrad
17 Beni Zeid
18 Awlad Badr
19 Al Kalabat
20 Ateyat Al-Ibleya
21 Tel Awlad Serag
22 Bosra
23 Al Namaysa
24 Reefa
25 Al Zawya
26 Al Zayara
27 Al Masoudi
28 Al Mashay'a Ibli
29 Al Amry
30 Ezbet El Aqbat
31 Al Etmaneya
32 Al Nawawra

Sohag governorate map



Legend:

Selected district (*markez*)

Selected village

1 Al Hasana
2 Al Shawaka
3 Kom el Arab
4 Al Hasamda
5 Kom Ashkaw
6 Nazlet Doweik
7 Kom Badr
8 Al Hareedeya el Bahareya
9 Negoo' el sawam'a gharb
10 Al Naza El Bahareya
11 Nazet el Mohazemeen
12 Al Gazazra
13 Beni Hilal
14 Al Galaweya
15 Al Ghareezat
16 Al Betakh
17 Bahaleel el Gezeera
18 Al Awameya
19 Neida
20 Abar El Malik
21 Al Salamoni
22 Al Sheikh Makram
23 Rawafi' El Qoseir
24 Al Hareezat El Gharbeya
25 Al Ahaywa Gharb
26 Al Kola
27 Al Shawawla
28 Awlad Hamza
29 Al Rashayda
30 Al Zawatna El Bahareya
31 Awlad Eleiw
32 Al Islah
33 Al Nosayrat

MOSS social workers placing a call for applications to the Minhet Al-Usra CCT programme (May 2010)
© Heba Gowayed

Mr. Mohammed Hassan from the Social Research Center explaining the CCT programme to village residents (May 2010)
© Heba Gowayed

Children returning from school in Al Amry (village 29 in Assiut governorate)
© Heba Gowayed

Rural health unit in Al Amry (village 29 in Assiut governorate)
© Heba Gowayed

10.7 Appendix G. Upper Egypt ethics procedures, approvals and data sharing agreement

IRB Procedure
"An Experimental Pilot of Conditional Cash Transfer Program in Egypt"
Principal Investigator: Hania Sholkamy, Social Research Center, AUC

The SRC will conduct research as part of the project **An Experimental Pilot of Conditional Cash Transfer Program in Egypt.** This project will enable the Egyptian Ministry of Social Solidarity (MOSS) to conduct a social experiment that introduces conditional cash transfers (CCT) to poor families residing in the poorest villages as identified by Egypt's poverty maps. The conditional cash transfer program will target poor families in Ain es Sira (non-experimental design) and Upper Egypt villages in Sohag and Assiut (experimental randomized design). This randomized experiment will be conducted in Upper Egypt in order to compare the outcomes of beneficiary households in treatment villages (receiving the CCT program at the beginning of the project) to households in control villages (receiving the CCT program after a 12 month period).

The subjects/households enrolled in the CCT program will benefit from direct cash transfers, provided by the Ministry of Social Solidarity, which they will receive on the condition that they comply with the conditionalities of the program specified in the contract signed between the female head of household and the MOSS. The beneficiaries will also be reminded of the conditionalities of the program in regular meetings with the MOSS social workers.

Participation in the two-year pilot requires families to fulfill child educational and health conditionalities in exchange for regular cash payments disbursed to female heads of households. Specifically, these conditions stipulate that children under 15 years old must be enrolled in school (school enrollment) and attend a certain percentage of school days (school attendance) every month. The health conditions require both children and adults from beneficiary families to attend regular preventive and follow up health checkups performed by the Ministry of Health and Population according to the current family health protocols (including receiving childhood vaccinations and ante-natal care for pregnant women). In addition, male and female head of beneficiary households will be asked to participate on regular program meetings with MOSS social workers and SRC research staff as well as to attend regular health awareness sessions.

A baseline survey will be conducted prior to the start of the pilot in both locations, followed by evaluations after one year and at the completion of the pilot (two-year mark). Alongside, qualitative research and process evaluation will be carried out during the pilot. The cash transfers will be financed by the MOSS and the research expenses by the Social Research Center (SRC) grants.

The aim of the CCT pilot in Upper Egypt is to test whether this social protection instrument is an effective tool for tackling poverty within Egypt and enabling families to meet health, gender and educational MDGs. The pilot will therefore be designed in order to both scale-up and test the efficacy and impact of the CCTs on poverty and on the capabilities of the poor and will be implemented and evaluated within a research framework that allows the gathering of rigorous data and informs the analysis on its impacts, cost, feasibility and process outcomes.

The research will be carried out in both Ain El-Sira and in Upper Egypt over the duration of three years, while the period of actual cash transfers is two years. The Social Research Center will act in the capacity of technical consultant to the MOSS during this pilot. Data produced in the process of implementing the CCT pilot is the property of MOSS and the SRC has the right to use this data for research and publishing purposes.

The SRC will be engaged in several research initiatives including:

(a) Upper Egypt: The SRC will conduct research on social policy, assessing the effects of conditional cash transfers and comparing the effect of a conditional cash transfer program on members of households and communities. The beneficiaries and members of control groups in all locations will participate in ethnographies of their areas, quantitative (in form of household questionnaires) and qualitative (focus groups, individual interviews as well as photography and film documentation) research studies on the broad areas of education, household spending and assets, health, nutrition and anthropometry. The SRC will also conduct research on issues of vulnerability, citizenship, gender empowerment and poverty, and its production in the area of Upper Egypt.

(b) Ain es Sira (Cairo): In addition, the SRC will be involved in the implementation phase of a CCT project in Ain El Sira, also in technical support of the Ministry of Social Solidarity, training the social workers involved in the project, and providing the monitoring and evaluating impact indicators. Beneficiary families in Ain es Sira will participate in ethnographies of their areas, quantitative (in form of household questionnaires) and qualitative (focus groups, individual interviews as well as photography and film documentation) research studies.

The approximate number of study subjects in Ain es Sira is 160 CCT beneficiary families, or 800 individuals. All beneficiary families will be asked to participate in the baseline and program impact evaluation research, which will be conducted through quantitative and qualitative research methods (household questionnaires, individual interviews, focus group discussions, photographic and film documentation).

In regards to the program in Upper Egypt, the program will be implemented in 18 villages in Assuit (having other 18 as control) and 16 villages in Sohag (having other 16 as control) which will be randomly assigned to the two groups. The approximate sample size for the research is 10,600 households (4,300 in Sohag and 6,300 in Assuit), half in treatment and half in control villages. In cooperation with MOSS, villages will be identified in which the CCT pilot shall be implemented, based on poverty measures of the MOSS. In these villages, an announcement will be made about the CCT program and encouraging voluntary applications. Beneficiaries will be selected from the applications based on two criteria: 1, applicants who agree to the stipulations of the CCT program (compliance with conditions), and 2, who comply with the poverty criteria (eligibility) of the MOSS. Within the announcement and application procedure it will be made clear to applicants that after the applications are taken and beneficiaries selected, a lottery of villages shall be conducted. This lottery will randomly assign half of the villages to start the CCT program immediately and half of the villages as control, stipulating that selected beneficiaries from control villages need to wait one year until they will be enrolled in the CCT program.

Staff involved in the collection of data will include MOSS social workers and other personnel, enumerators contracted from external suppliers, health personnel at facilities in beneficiary communities, additional staff supplied by the Ministry of Health and Population under agreement with MOSS, AUC/SRC research staff and researchers/trainers affiliated with AUC.

Statement of informed consent (Ain es Sira and Upper Egypt CCT beneficiaries)
The following statement will be read or provided to study subjects during all research other than data collected in the process of monitoring and recording of the beneficiaries fulfillment of conditions as specified in the contract between the household and the MOSS:

This research is conducted by researchers from the American University in Cairo on behalf on the Ministry of Social Solidarity because you and your family are beneficiaries of the Conditional Cash Transfer Program. The purpose of this research is to evaluate the impact of this program on individuals, families and communities. There is no foreseeable risk to you if you participate in this research. No monetary or non-monetary benefits will be afforded to you in return for participating in this research aside for the transfers you/your family are already receiving through the CCT program. There is no additional cost to you that may results from participation in this research. If in the process of this research any photographs of films are made of you and your family, we will ask for your approval before using such materials in publications, program documentation or materials.
The information you give in this research will not influence your current or future participation in projects or schemes conducted by the MOSS. Your records will be used for research purposes only, accessible to researchers and be kept confidential. Any results from this research shall be reported anonymously. Your participation is voluntary, refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled and you may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled. However, if you not comply with the conditionalities required (as specified in the contract), your/your family's participation may be terminated by the MOSS or your cash transfers may be reduced. The AUC is not responsible for the giving or revoking of benefits, this is within the discretion of the MOSS who is implementing the project.
Questions about the research, rights, or research-related injuries should be directed to Hania Sholkamy at 02-26151313.

Statement of informed consent (Upper Egypt control group participants)
The following statement will be read or provided to study subjects who are not at that point in time beneficiaries of the CCT program but are asked to participate in research as a control/comparative group:

"This research is conducted by researchers from the American University in Cairo on behalf on the Ministry of Social Solidarity. The purpose of this research is to evaluate the impact of a social protection program on individuals, families and communities. There is no foreseeable risk to you if you participate in this research. No monetary or non-monetary benefits will be afforded to you in return for participating in this research. There is no additional cost to you that may results from participation in this research. If in the process of this research any photographs of films are made of you and your family, we will ask for your approval before using such materials in publications, program documentation or materials. The information you give in this research will not influence your future participation in projects or schemes conducted by the MOSS. Your records will be used for research purposes only, accessible to researchers and be kept confidential. Any results from this research shall be reported anonymously. Your participation is voluntary, refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled and you may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.
Questions about the research, rights, or research-related injuries should be directed to Hania Sholkamy at 02-26151313.

After the delivery (verbally or in written form) of the informed consent statement, the research subjects will be asked whether they need additional clarification or have any questions. Once the researcher has ensured there are no more questions and the subject agrees to participate in the research, the receipt of informed consent shall be documented and will depend on the method of research, outlined below:

Research method	Delivery of informed consent statement	Receipt of consent
Individual interview – with questionnaire filled out	Informed consent will be read out to the research subject and in written form constitute an integral part of the questionnaire.	Research subject signs/marks the statement in the questionnaire if agreeing to proceed with research.
Individual interview – with guidelines, answers being recorded	Informed consent will be read out to the research subject and will be provided in written form to subject to review.	Research subject signs/marks the statement if agreeing to proceed with research and returns it to researcher.
Focus group discussion (multiple participants, recorded)	Informed consent will be read out to the research subject(s) and will be provided in written form to subjects to review.	Research subjects sign/mark the statement if agreeing to proceed with research and return it to researcher.
Observation, ethnographic research, photography and film	Informed consent will be read out to the research subject(s) and will be provided in written form to subjects to review.	Research subjects sign/mark the statement if agreeing to proceed with research and return it to researcher. If photographs or films were made that are to be used publicly (publications, presentations, program materials such as monitoring tools), separate agreement will be sought for this purpose from research subjects or legal guardians if under age 18.

THE AMERICAN UNIVERSITY IN CAIRO
OFFICE OF THE VICE PROVOST

To: Hania Sholkamy

From: Dr. Graham Harman/ Chairman, IRB

Date: October 22, 2009

Re: approval of study

This is to inform you that I reviewed your revised research proposal entitled "An Experimental Pilot of Conditional Cash Transfer Program in Egypt", and determined that it used appropriate procedures to minimize risks to human subjects and that adequate provision was made for confidentiality and data anonymity of participants in any published record. I believe you will also make adequate provision for obtaining informed consent of the subjects, and therefore I believe the proposal qualifies for exempt review, meaning that I have approved it without convening the full Institutional Review Board.

Thank you and good luck.

Graham Harman

London School of Hygiene & Tropical Medicine
(University of London)

Keppel Street, London WC1E 7HT
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Improving health worldwide

Dr. Hania Sholkamy
Associate Research Professor
Social Research Center
The American University in Cairo
AUC Avenue, P.O. Box 74
New Cairo 11835
Egypt

October 15, 2012

Re: Data collected by the CCT group at the Social Research Center for Research Project entitled Piloting a Conditional Cash Transfer in Upper Egypt (Assiut and Sohag)

Dear Dr. Sholkamy,

This letter is to confirm our understanding related to the baseline data collected for the Conditional Cash Transfer project in Upper Egypt between November 2010 and January 2011.

The anonymized dataset may be transferred to London School of Hygiene and Tropical Medicine to enable me to continue the analysis of this data for the purposes of completing a PhD on the topic of 'Socio-demographic determinants of health-seeking behaviour in Upper Egypt'. Within this use, the data may be made available to my thesis advisor, Dr. George Ploubidis, and other members of the thesis advisory committee.

The data may also be used to publish the results of such analysis in peer reviewed journals and at conferences. In any such publication, the source of the data will be duly acknowledged.

The data will not be transferred outside of LSHTM without your prior agreement.

Yours sincerely,

Agreed, Lenka Benova

Date: Oct 15, 2012

Agreed, Dr. Hania Sholkamy

Date: Oct 15, 2012

10.8 Appendix H. Upper Egypt poverty targeting

The analysis shown in this appendix is a part of a larger manuscript on effective poverty targeting in Egypt, co-authored with Professor Hania Sholkamy. This manuscript will be submitted for publication in 2015.

Household-level poverty comparison

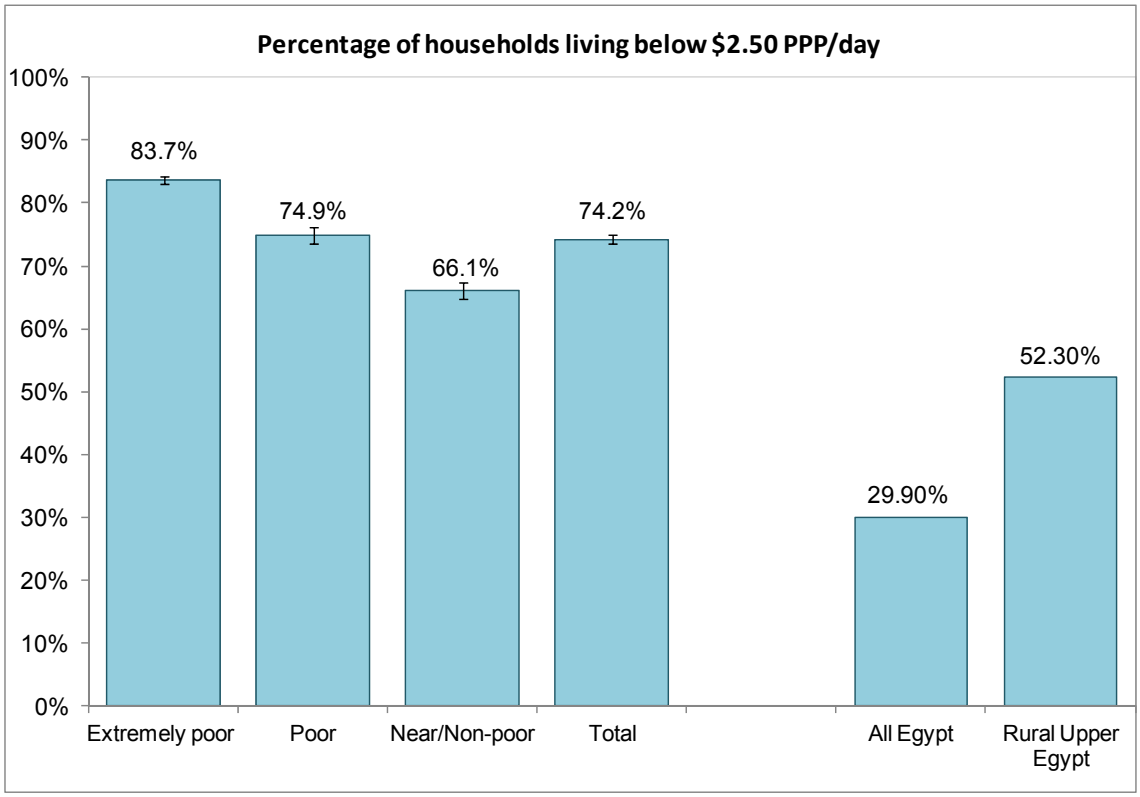
Poverty can be measured as an absolute or relative construct. The aim of absolute measurements of poverty is to estimate the proportion of households that live below a certain threshold. I used both approached to estimate the poverty/socio-economic position of households in the Upper Egypt CCT sample, in order to estimate and compare their absolute and relative social standing. In regard to the absolute assessments, the Progress out of Poverty™ method was used to estimate the proportion of households in each group living below $2.50/PPP/day.

Progress out of Poverty® Methodology

Progress out of Poverty Index® (PPI) method developed by Grameen Bank on the basis of the HIECS 2004/5 Egypt survey was used to estimate the proportion of households in the three (extremely poor, poor, near/non-poor) poverty categories (based on MOSA poverty targeting formula).[1] PPI estimates of proportion of households in Egypt overall and in rural Upper Egypt are provided for comparison. Survey sampling weights were applied in order to estimate the proportions of households living under the $2.50/PPP/day poverty line, and confidence intervals of these estimates. The proportion of households living under $2.50/day differ significantly between the three poverty groups (Figure 10.1). However, compared to the overall average (Egypt) and rural Upper Egypt average, the proportion living under this poverty line is significantly higher even in the 'near/non-poor' group. This may indicate that although the MOSA poverty targeting formula can, to some extent, distinguish between households with different expenditure levels, other elements of the program recruitment/eligibility procedure (i.e., self-selection) contributed to the fact that the applicants to the program were significantly more likely to live below the $2.50 poverty line not only compared to Egypt average, but also the rural Upper Egypt average.

[1] Schreiner M (2010) Progress out of Poverty Egypt. http://www.progressoutofpoverty.org/country/egypt (Accessed March 21, 2014): Microfinance Risk Management, L.L.C.

Figure 10.1 Proportions of households living below $2.50 PPP per day



Notes: Extremely poor, poor, near/non-poor and total refer to groups among the baseline sample of households that applied to the CCT program. The sample sizes are very poor (n=3884), near poor (n=953), non poor (n=988) adding up to a total of 5825 households. 'All Egypt' and 'Rural Upper Egypt' are proportions of households estimated to live below the $2.50/day line based on the HIECS 2004/5 complete dataset, as provided by PPI.

Child deprivation assessed by Bristol child deprivation index

The Bristol child deprivation method[2] was proposed and developed to assess deprivation among children from a multidimensional perspective. The components of this assessment available in the Upper Egypt dataset are listed and defined in Table 10.1. Application of this method to the three poverty groups, shown in Figures 10.2-10.5 confirmed that the level of deprivation is more extensive among the extremely poor than among the poor and non-poor. This was expected, because some of the characteristics of household environment, namely crowding and sanitation, are shared by both the targeting formula and by the child deprivation methodology. Comparison to representative samples from the poorest household wealth quintile and rural Upper Egypt sampled on the 2008 DHS show that the extent of child deprivation among all the poverty groups is higher than among the general population.

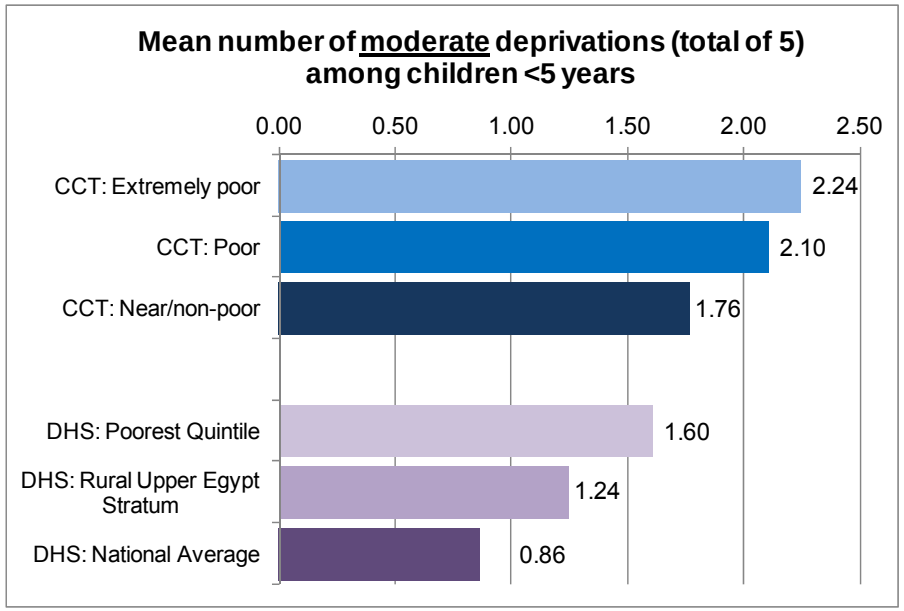
[2] Gordon D, Nandy S, Pantazis C, Pemberton S, Townsend P (2003) Child poverty in the developing world. London, Uk: The Policy Press.
UNICEF (2011). A Multidimensional Approach to Measuring Child Poverty. http://www.unicef.org/socialpolicy/files/A_Multidimensional_Approach_to_Measuring_Child_Poverty%282%29.pdf (Accessed November 25, 2013).

Table 10.1 Bristol child deprivation components and definitions as applied to Upper Egypt survey

Component	Severe Deprivation		Moderate Deprivation	
	Children 0-5 years	Children 6-18 years	Children 0-5 years	Children 6-18 years
Food/Nutrition	3 SD below international reference population for stunting (height for age), wasting (weight for height) or underweight (weight for age).	n/a	2 SD below international reference population for stunting (height for age), wasting (weight for height) or underweight (weight for age).	n/a
Health	Never immunized against any diseases. Had a recent child illness (cough, diarrhoea or fever) and did not receive treatment.	n/a	Children 1 year and older who received fewer than eight of the following immunizations (BCG, DPT1-3, Polio 0-3, MMR). Had a recent child illness (cough or diarrhoea) and did not receive treatment.	n/a
Education	n/a	Children of school age who were never enrolled in education.	n/a	Children of school age who are not attending education or dropped out before completing primary school.
Water	Drinking water pumped from unknown source.	Drinking water pumped from unknown source.	Do not have a piped water connection in the dwelling.	Do not have a piped water connection in the dwelling.
Sanitation	Children without access to a toilet or latrine (private or shared).	Children without access to a toilet or latrine (private or shared).	Only have access to unimproved sanitation facilities (JMP definition).	Only have access to unimproved sanitation facilities (JMP definition).
Shelter	Crowding >5 persons/bedroom Dwelling has no floor.	Crowding >5 persons/bedroom Dwelling has no floor.	Crowding >4 persons/bedroom Dwelling has no floor or roof.	Crowding >4 persons/bedroom Dwelling has no floor or roof.
Number of components	**5**	**4**	**5**	**4**

No data on the information and access to basic services indicators were available.

Figure 10.2 Results of Bristol child deprivation analysis: Mean number of moderate and severe deprivations among children <5 years, by household poverty level



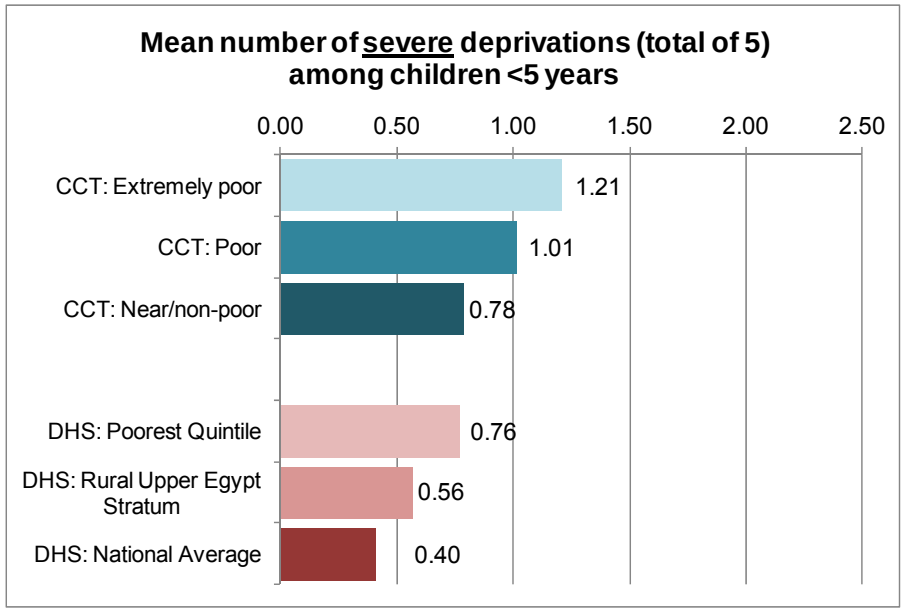
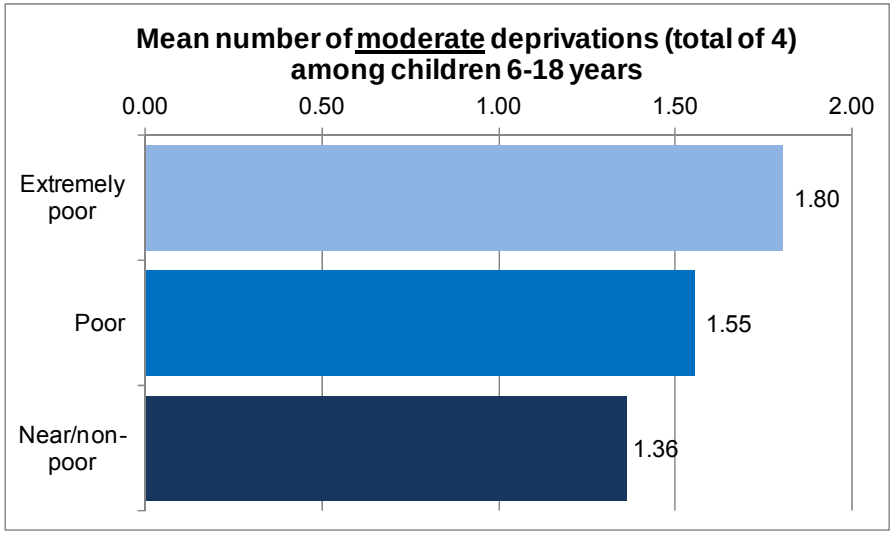
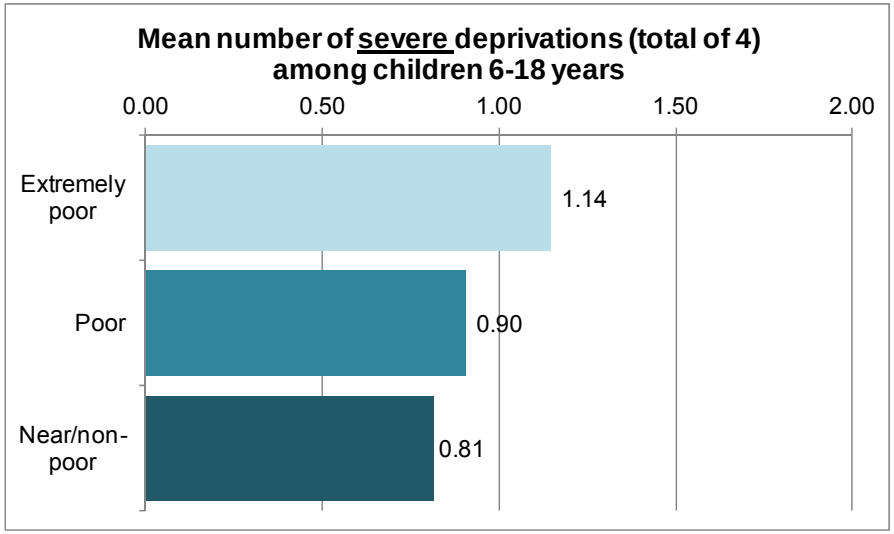


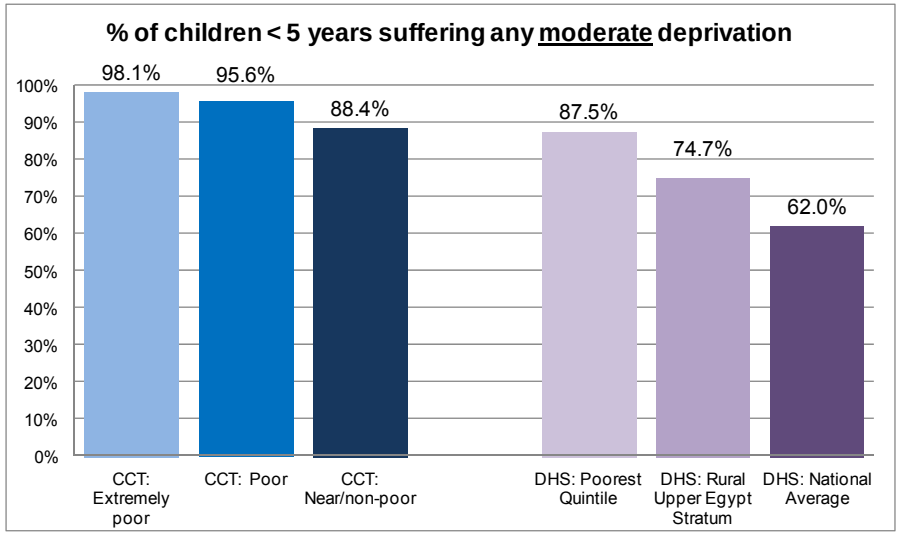
Figure 10.3 Results of Bristol child deprivation analysis: Mean number of severe deprivations among children 6-18 years, by household poverty level





Comparison with DHS was not possible in this age group.

Figure 10.4 Results of Bristol child deprivation analysis: Proportion of children <5 years with any moderate or severe deprivation



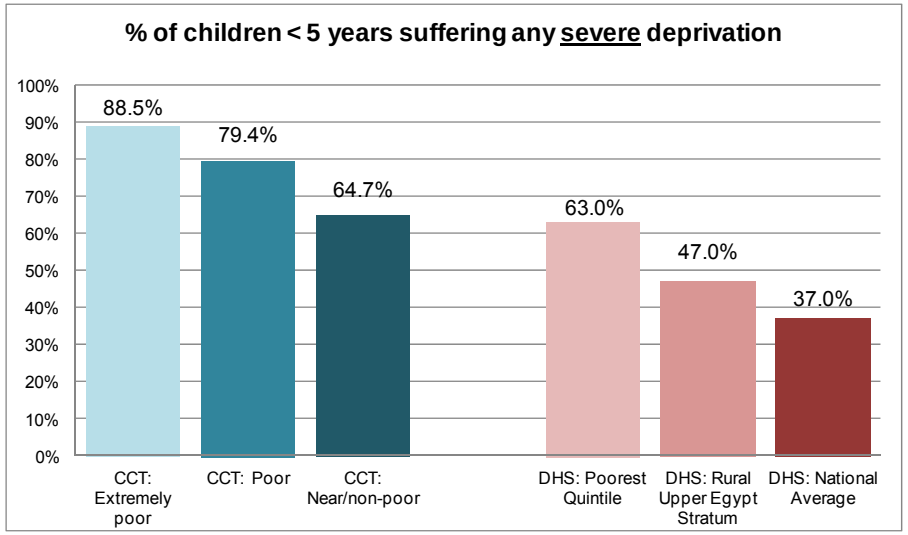
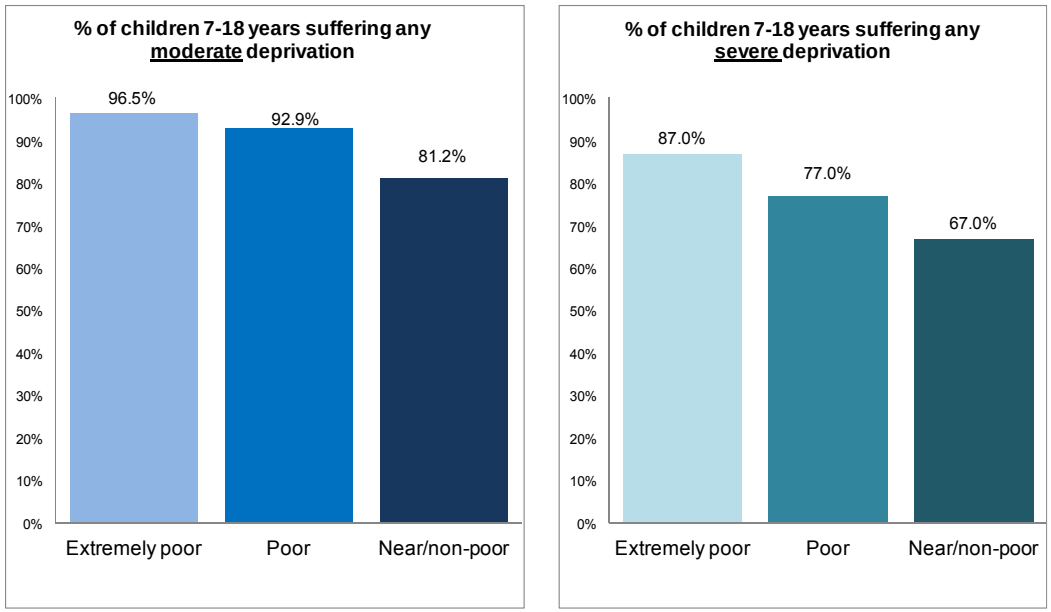


Figure 10.5 Results of Bristol child deprivation analysis: Proportion of children 6-18 years with any moderate or severe deprivation



Comparison with DHS was not possible in this age group.

10.9 Appendix I. Variables constructed from Upper Egypt survey for consideration in latent variable analysis

Level	Variables available
Individual	- Woman's education - Woman's literacy - Woman's current employment status - Husband's (male head of household) education - Husband (male head of household) occupational category - Proportion of adults that ever attended school - Woman's mobility in daily activities (with/without permission/not at all): Run an errand, visit neighbours, visit relatives, go out to spend time outside house, seek healthcare, go to the market, leave the house - Decision in the following areas, you, your husband, both you and your husband or someone else?: Healthcare for self, healthcare children, children education, household budget, visiting friends/family
Household	- Number of extended family members - Number of household members migrated for work outside of governorate - Supervision ratio: Children <18 to adults (>18 years) - Crowding >4.5 (Upper Egypt poor median) - Binary asset ownership: Fridge, mobile phone, colour TV, water heater, ownership of a bank account, stove top, stove with oven, bicycle, landline phone, washing machine (automatic or regular) - Dwelling characteristics (binary): Piped water, flush toilet, house: independent house/apartment, floor (cement, tile, plastic), ceiling (concrete or tile), brick walls, electricity from public network - How does the family pay the cost of food (cash, debt, both) - Number of subsidized '*baladi*' bread loaves bought per day - Number of household members with income from employment - Number of household members with income from pensions - Animal ownership: Water buffalo, milk cows/bulls, horses/donkeys/mules, goat/sheep, poultry (chickens, ducks, pigeons) - Access to land (own, co-own or rent) - School enrolment/attendance among children: Are there any children 7-18 years old in the household that have never been enrolled in school? - Anthropometry: Stunting in youngest child in the family <7 years - Nutritional intake of youngest child of school age – between 3 and 18 years in the household in the last 24 hours (binary): Consumed dairy, fruits, vegetables, legumes, meat - Play time outside (all children<18 years) - Do all household members have a birth certificate and all household members >15 years have national identity papers - Receive any assistance from family - Receive any assistance from government/NGO or other source - Do any of the household members have an outstanding debt obligation - Ownership of a ration card

10.10 Appendix J. Upper Egypt maternal paper (Chapter 8)

Benova et al. International Journal for Equity in Health 2014, 13:111
http://www.equityhealthj.com/content/13/1/111

INTERNATIONAL JOURNAL FOR EQUITY IN HEALTH

RESEARCH Open Access

Socio-economic factors associated with maternal health-seeking behaviours among women from poor households in rural Egypt

Lenka Benova[1*], Oona MR Campbell[1], Hania Sholkamy[2] and George B Ploubidis[1,3]

Abstract

Introduction: Socio-economic inequalities in basic maternal health interventions exist in Egypt, yet little is known about health-seeking of poor households. This paper assesses levels of maternal health-seeking behaviours in women living in poor households in rural Upper Egypt, and compares these to national averages. Secondly, we construct innovative measures of socio-economic resourcefulness among the rural poor in order to examine the association between the resulting variables and the four dimensions of maternal health-seeking behaviour.

Methods: We analysed a cross-sectional survey conducted in Assiut and Sohag governorates in 2010–2011 of 2,242 women in households below the poverty line in 65 poorest villages in Egypt. The associations between four latent socio-economic constructs (socio-cultural resourcefulness, economic resourcefulness, dwelling quality and woman's status) and receipt of any antenatal care (ANC), regular ANC (four or more visits), facility delivery and private sector delivery for women's most recent pregnancy in five years preceding survey were assessed using multivariate logistic regression.

Results: In the sample, 58.5% of women reported using any ANC and 51.1% facility delivery, lower than national coverage (74.2% and 72.4%, respectively). The proportion of ANC users receiving regular ANC was lower (67%) than nationally (91%). Among women delivering in facilities, 18% of women in the poor Upper Egypt sample used private providers (63% nationally). In multivariate analysis, higher economic resourcefulness was associated with higher odds of receiving ANC but with lower odds of facility delivery. Socio-cultural resourcefulness was positively associated with receiving any ANC, regular ANC and facility delivery, whereas it was not associated with private delivery care. Dwelling quality was positively associated with private delivery facility use. Woman's status was not independently associated with any of the four behaviours.

Conclusions: Coverage of basic maternal health interventions and utilisation of private providers are lower among rural poor women in Upper Egypt than nationally. Variables capturing socio-cultural resourcefulness and economic resourcefulness were useful predictors of ANC and facility delivery. Further understanding of issues surrounding availability, affordability and quality of maternal health services among the poor is crucial to eliminating inequalities in maternal health coverage in Egypt.

Keywords: Maternal health, Egypt, Ante-natal care, Facility delivery, Health-seeking behaviour, Poverty

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Introduction

Egypt witnessed large improvements in maternal health outcomes in recent decades. Maternal mortality ratio decreased from 230 to 66 per 100,000 live births between 1990 and 2010 [1], partly as a consequence of the steadily increasing coverage of preventive and curative interventions. Between 1992 and 2008, the proportion of births covered by regular antenatal care (four or more ANC visits during the pregnancy) increased from 23% to 66%. Nationally, the percentage of births that took place in a health facility increased from 27% in 1992 to 72% in 2008 [2]. However, a complex dynamic underlies these overall trends. Perceived poor quality and inconsistent services provided by the public sector has led to increasing use of private providers. This has resulted in an increase in out-of-pocket health expenditures, which can have a devastating impact on the precarious economic situation of the large proportion of households living near or below the poverty line [3].

Living standards or social hierarchy, captured through various measures of socio-economic position (SEP), are associated with health outcomes in virtually every context where they have been studied [4]. This association has been hypothesised to arise based on the five components of the direct pathway (utilisation of healthcare, psychosocial stress, environmental hazards, health knowledge and lifestyle behaviours) [5-8]. Health-seeking behaviour, representing decisions and actions to seek help from the healthcare system, one of the direct causes, is most amenable to relatively rapid change through policy interventions. An analysis of the sequence of decisions and underlying determinants of choices, from approaching a care provider to the expenditure incurred, is crucial to understanding decision-making mechanisms within households, many of which necessitate stark trade-offs between healthcare-related and other essential household expenditures.

A systematic review of literature published in the previous two decades assessed SEP gradients in maternal health-seeking behaviours in Egypt [9]. Among the six included studies, three dimensions of ANC health-seeking (whether care was received, provider type and intensity of care) and one dimension of delivery health-seeking (provider type) were examined. There is a limited understanding of individual and household-level determinants which may be associated with progression through the various dimensions of health-seeking in poor households. The proportion of Egyptians living below the poverty line increased from 16.7% to 26.3% between 2000 and 2012/2013, with most of the increase seen in rural areas [10]. Upper Egypt is home to 25% of the country's population, but accounts for 66% of the extremely poor. We hypothesise that 'traditional' measures of SEP will have limited utility in differentiating socio-economic environments of poor households and therefore as determinants of health-seeking behaviour.

The current paper contributes to the research on health inequalities in Egypt by analysing the determinants of health-seeking behaviour among poor households in Upper Egypt. The objective of this paper is three-fold. Firstly, we compare the national levels of health-seeking behaviour for maternal care with those reported by women living in households below the poverty line in rural Upper Egypt. Secondly, we construct innovative measures of socio-economic position among the rural poor by broadening the understanding to encompass resourcefulness. Thirdly, we examine the association between the resulting variables capturing SEP and maternal health-seeking behaviour. We hypothesise that the higher the socio-economic resourcefulness, the higher the odds of receiving maternal care. We also hypothesise that utilization of private care will be positively associated with a construct capturing economic or financial resourcefulness. The main contribution of this study stems from conceptualising dimensions of SEP beyond traditional indicators such as asset ownership and educational achievement. Based on Hausmann-Muela's suggestion that "[t]o a great extent, health-seeking of households depends on their capacity and possibility at a specific moment to mobilise resources, both in material and social or symbolic terms"[11], we aim to capture the operationalization of scarce resources available to poor households. Such detailed analysis of determinants of seeking maternal care is crucial in order to design targeted interventions to address the remaining gap in the coverage of these essential health services.

Methods

Data source: households living below poverty line in rural Upper Egypt

A cross-sectional survey, conducted between November 2010 and January 2011 in 65 of the poorest villages in two poorest governorates in Egypt (Assiut and Sohag), was based on a stratified random sample selected from among 25,200 families who applied to and fulfilled the eligibility criteria for the conditional cash transfer program (children of school-age in households). The Ministry of Social Solidarity proxy means testing formula, which contains 17 components (household size and composition, dwelling characteristics, asset ownership, education and occupation status, consumption of utilities and geographic location) was used to include only households living below the poverty line. The sample in our analysis consists of 2,242 women who reported giving birth in the five years preceding the survey and who were not pregnant at the time of the survey. Comparisons with health-seeking behaviours among various groups of women captured on the 2008 Egypt Demographic and Health

Survey (DHS) were conducted. The DHS is used to show health-seeking behaviours for three samples: all women (nationally representative sample), women living in Upper Egypt governorates, and women in the poorest DHS wealth quintile living in Upper Egypt.

Ethical approval

The analysis of these data was approved by the Research Ethics Committee of the London School of Hygiene and Tropical Medicine, UK. Collection of the Upper Egypt dataset was approved by the Institutional Review Board of the American University in Cairo.

Exposure: measures of socio-economic position

In order to identify variables which might capture socio-economic position, we compiled a list of traditional variables used in our previous analysis of the nationally-representative Demographic and Health Survey (DHS, 2008) and identified in the systematic literature review [9]. Additionally, we conducted a broad literature review in order to identify potential variables capturing household-level utilisation of resources and which were available in the Upper Egypt dataset. This wide literature review spanned gender and women's studies with particular focus on Middle East contexts [12-15] and development [16,17]; economic literature examining household dynamics [18] and intra-household allocation of resources [19-21] as well as global experience from evaluations of social policy and protection programmes [22,23]. This approach led us to identify 63 variables available in the dataset.

Outcome: maternal health-seeking behaviours

Ante-natal care: Utilisation of ANC for the most recent pregnancy were assessed in two ways (Figure 1). The first was a binary variable indicating whether the woman received any ANC during the pregnancy. If ANC was utilised, a second binary variable described whether regular ANC care, consisting of four or more visits during pregnancy was received or not.

Delivery care: We used two health-seeking behaviour outcomes to describe women's utilisation of delivery care for their most recent delivery (Figure 1). Binary variables captured firstly, whether or not the most recent delivery in the 5-year recall period occurred in a health facility or not; and secondly, among the subset of women with facility deliveries, whether or not private provider was used for this care. The definition of private providers included all non-public sector providers (private hospitals/clinics, private doctor's offices and other private medical facilities, including NGOs).

Confounders

A priori confounders of the association between SEP and maternal health-seeking behaviours were identified from published literature [24,25]. These included woman's age group (in 5-year age intervals) and the number of children (<18 years old) residing in the household. In addition, elements of access, and availability of health services were captured by the relative size of villages (small: less than 6,500 inhabitants, medium: 6,500 to 14,499 and large: >14,500) and of the district (*markez*) (small: <249,000; medium: 250,000 to 349,000 and large: >350,000 inhabitants) according to the 2006 population census figures (CAPMAS). ANC utilisation was considered a potential confounder in analyses of delivery care, capturing pre-delivery exposure to pregnancy-related health services and information.

Statistical analysis

Exploratory and confirmatory factor analysis (EFA, CFA) was conducted to investigate the measurement structure and determine the composition of the latent SEP variables. This approach acknowledges that whereas female heads of household may be primarily responsible for their own health-seeking [26], their decisions are made within - and shaped by - their immediate social environment [12,27]. It is an attempt to capture results of previous intra-household negotiations about the distribution of scarce resources. The variables suggested to reflect the construct of resource management are not new in their

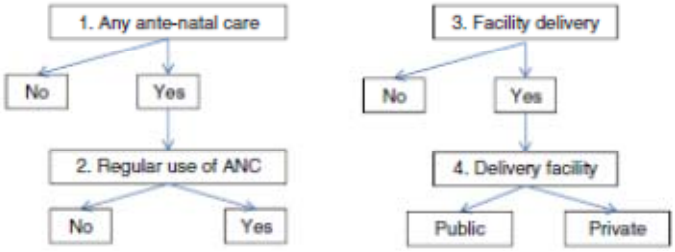

Figure 1 Four dimensions of health-seeking behaviours analysed. All women with birth in recall period: Health-seeking behaviour of most recent birth.

use in economics or public health [28], but their inclusion in a latent model with other SEP measures is innovative.

To quantify unobservable constructs, latent variable modelling utilises common variance among observed indicators. This technique disregards variance that is not common from the latent summary, including random error. The aim is to reduce the dimensionality of the observed data, but to retain a good representation within the latent variable identified [29,30]. Latent variables were constructed in Mplus 7.11 using the Weighted Least Squares, Mean and Variance adjusted (WLSMV) estimator. The latent variables were measured in the sample of women who had a birth in the 5-year period prior to the survey. Hence, unlike the DHS wealth index, which assesses wealth in a nationally-representative sample of households, our SEP variables capture the distribution of the constructs in this specific group of women. Factor loadings of each observed variable represent the association between this indicator and the underlying construct. Model fit was assessed with the Comparative Fit Index (CFI), the Tucker Lewis Index (TLI) and the Root Mean Square Error of Approximation (RMSEA). Full information maximum likelihood (FIML) method was used to deal with missing data in the construction of latent variables and all observations with at least one non-missing value in the observed variables were used. Multivariate logistic regression was used to assess the association between the resulting continuous latent variables identified and maternal health-seeking behaviours, adjusted for confounders. We accounted for the complex survey sampling (clustering within villages and sampling weights) by using the *svyset* command in Stata/SEv.13. The proportion of missing data in the outcome variables was minimal and we utilised complete case analysis.

Results

Levels of maternal health-seeking behaviour

Table 1 displays the demographic and socio-economic characteristics of the three analysis groups of women from the Upper Egypt sample of households living below the poverty line. We compared the utilisation of maternal health services among the women from poor households in Upper Egypt to the representative sample in the 2008 DHS. Figure 2 and Table 2 show the proportions of women accessing any ANC and facility-based delivery in four samples: nationally representative DHS sample, DHS sub-sample of women living in Upper Egypt, DHS sub-sample of women in the lowest DHS wealth quintile living in Upper Egypt, as well as the Upper Egypt sample of women from poor households in Assiut and Sohag. The utilisation of both maternal services among the Upper Egypt poor was lower than national levels, but significantly higher than the poorest DHS quintile in Upper Egypt. Figure 3 summarises the four maternal health-seeking behaviours under examination in the sample of the Upper Egypt poor and for comparison, in the nationally representative sample captured by the DHS. Among women with a birth in the five years preceding the surveys, nationally 74.2% (95% CI: 72.8-75.6) reported having received any ANC for their most recent birth and 58.5% (95% CI: 55.6-61.4) in the Upper Egypt sample. Among ANC users, the proportion of women receiving regular ANC was substantially higher in the national DHS sample (91%) compared to 67% in the Upper Egypt sample of poor. In the national sample, 72.4% (95% CI: 70.8-73.9) of women with a birth in the recall period reported delivering in a health facility, 63% of them having used a private provider. In the Upper Egypt sample, 51.1% (95% CI: 46.1-56.0) of women reported delivering in a health facility, but only 18% of these facility deliveries took place in the private sector.

Construction of latent variables capturing socio-economic position

Exploratory factor analysis identified four latent constructs. In confirmatory factor analysis, the latent measurement models for all four constructs had an acceptable fit to the data; the RMSEA level was ≤0.05 and the CFI/TFI ≥0.963, as shown in Table 3. The standardized loading for each observed variable and its standard error are shown in Table 4 (components A,B,C and D).

Firstly, we identified a latent measure of *socio-cultural resourcefulness*, which was constructed of seven observed variables. This included four traditional variables (woman's years of education, woman's literacy level, male head of household years of education, male head of household occupational category) and three innovative indicators (school enrolment of school-age children, possession of identity documents by members of the household and proportion of all adult member of the household who had ever attended school). The mean standardised socio-cultural resourcefulness score was −0.002 (standard error [SE]: 0.042, range: −1.383 to 2.039); the higher the factor score, the higher the socio-cultural resourcefulness. The observation with a median socio-cultural resourcefulness score was characterised as an illiterate woman with no education, with a husband in manual or agricultural occupation with five years of education, in a household where all children of school age are enrolled in school, all household members possess identity documents and where 50% of adult members had attended school at some point.

Secondly, measurement of rural *economic resourcefulness* was based on twelve variables, ownership of four household assets (fridge, colour TV, washing machine and house/apartment), agricultural assets (access to land and ownership of five types of domestic animals) as well as two innovative indicators (possession of a ration card and fruit consumption of the youngest child of school

Table 1 Distribution of demographic and socio-economic variables in sample of women with a birth in the five-year recall period (Upper Egypt households living below poverty line)

Characteristic	Sample of women	Women with live birth	ANC users	Facility delivery users
	Weighted sample size	*2,242*	*1,266*	*1,143*
Woman age group	18-24 (column %)	7.0	8.6	8.3
	25-29	24.3	24.1	26.8
	30-34	26.5	27.9	24.9
	35-39	26.0	26.0	23.4
	40 and above	16.2	13.4	16.6
Number of children	1-2 (column %)	10.5	12.8	13.7
in household	3-4	39.5	38.6	41.9
	5-6	39.5	39.4	35.1
	7 or more	10.5	9.2	9.3
Village size	Small (<6,500) (column %)	18.4	20.3	20.4
	Medium (6,500-14,499)	31.3	29.5	27.8
	Large (>14,500)	50.3	50.2	51.8
District size	Small (<249 K) (column %)	37.2	35.8	32.2
	Medium (250 K-349 K)	26.8	26.1	25.2
	Large (>350 K)	36.0	38.1	42.6
Governorate	Assiut (column %)	60.9	63.3	64.6
	Sohag	39.1	36.7	35.4
Socio-cultural resourcefulness	Mean	−0.002	0.075	0.076
	SE	0.042	0.052	0.052
Economic resourcefulness	Mean	0.057	0.082	−0.012
	SE	0.032	0.036	0.034
Dwelling quality	Mean	−0.020	0.007	0.012
	SE	0.034	0.035	0.037
Woman's status	Mean	0.015	−0.018	0.031
	SE	0.032	0.035	0.038

SE: standard error. Complex survey design was accounted for in calculations of proportions and sample sizes reported.
K – thousand.

age in the 24 hour period preceding the survey). The mean standardised economic resourcefulness score was 0.057 (SE: 0.032, range: −1.276 to 2.532) and the higher the factor score, the higher the economic resourcefulness. A median economic resourcefulness score described a household which does not own a fridge or a colour TV, but owns a washing machine (automatic or semi-automatic), lives in a house or apartment which is shared with other households, has no access to land (owned, co-owned or rented), does not own any large domestic animals (buffalo, cows, horses, goats or sheep) but owns poultry, has access to a ration card, and where the youngest child consumed a portion of fruit during the recall period.

Thirdly, we identified a latent variable reflecting six observed characteristics of the *dwelling quality*, including the type of water and electricity connection, availability of a landline telephone, as well as construction materials of the floor, ceiling and walls. The mean standardised dwelling quality score was −0.020 (SE: 0.034, range: −1.692 to 1.213) and the higher the factor score, the higher the dwelling quality. A median dwelling quality score described a household which had a piped water connection and electricity from the public network, but no landline telephone connection, where the floor was not from cement, tile or plastic; the ceiling was not from concrete or tile; and where the walls were constructed from red brick.

Fourthly, eight observed variables describing various aspects of woman's mobility and decision-making ability reflected a construct which we termed *woman's status*. The mean standardised woman's status score was 0.015 (SE: 0.032, range: −2.735 to 1.720) and the higher the factor score, the higher the woman's status. A woman

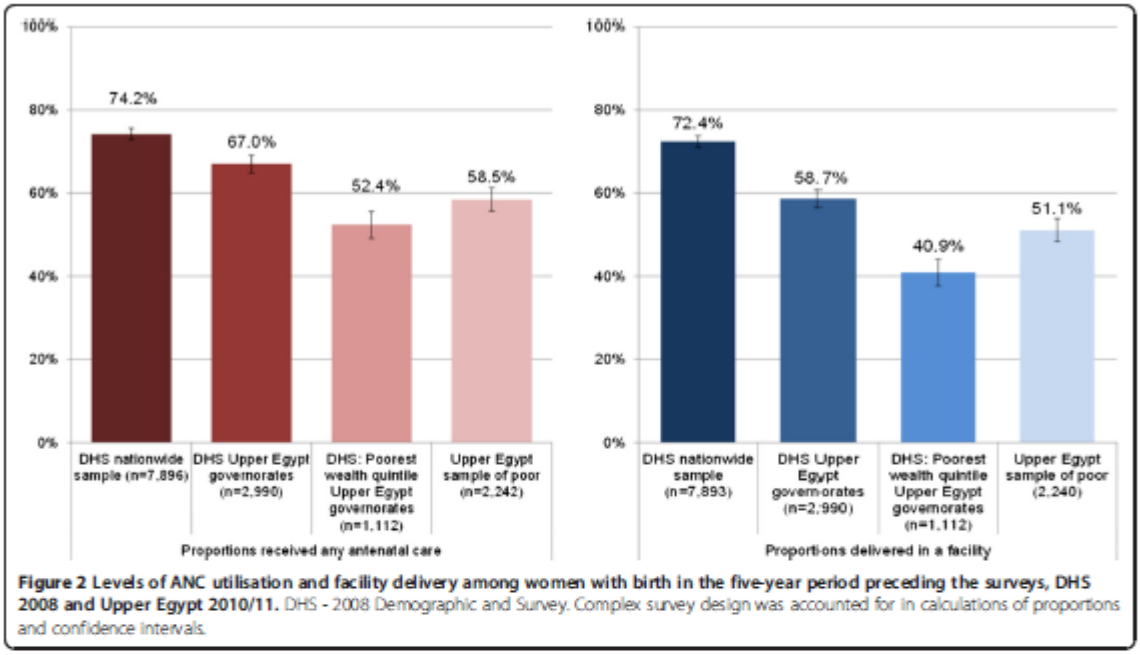

Figure 2 Levels of ANC utilisation and facility delivery among women with birth in the five-year period preceding the surveys, DHS 2008 and Upper Egypt 2010/11. DHS - 2008 Demographic and Survey. Complex survey design was accounted for in calculations of proportions and confidence intervals.

with a median level of woman's status score reported being able to go to a hospital without permission, being able to leave the house, visit relatives and run errands with permission, but not being allowed to go to the market or visit neighbours, and who solely or jointly with her husband took decisions about whether to visit friends or family, but whose husband was the sole decision-maker about the household budget.

The correlation matrix between the four latent variables is shown in Table 5 (component A). Among the variables, the only significant association was between socio-cultural resourcefulness and dwelling quality. We assessed the crude associations between the four latent variables and the area-level characteristics (village size, district size and governorate), as shown in Table 5, component B. Socio-cultural resourcefulness was associated with district size; the larger the district, the higher the mean socio-cultural resourcefulness score. Economic resourcefulness was associated with all three area-level variables. The mean score was lower in smaller villages, larger in smaller districts, and higher in Sohag than in Assiut. Dwelling quality score was positively associated with larger village and district sizes, but not with governorate. Woman's status was not associated with any of the geographic variables.

Determinants of maternal health-seeking behaviour in Upper Egypt poor

Any ANC use

The adjusted analysis of determinants of ANC use showed that both higher socio-cultural resourcefulness

Table 2 Maternal health-seeking behaviours for most recent birth in recall period

Health-seeking behaviour outcome	Variable type	Samples and missing data				Distribution of outcome in analysed sample and 95% CI
		Eligible sample and recall period	Eligible sample (size)	Missing data (%)	Analysed sample (size)	
Ante-natal care (ANC)						
1. **Used ANC**	Binary	All women with birth 5 years prior to survey	2,242	-	2,242	58.5% (55.6 - 61.4)
2. **Regular use of ANC (4+ visits)**	Binary	All women with birth 5 years prior to survey who used any ANC	1,312	3.5	1,266	66.9% (63.6 – 70.1)
Delivery care						
3. **Delivered in a health facility**	Binary	All women with birth 5 years prior to survey	2,242	<0.01	2,240	51.1% (46.1 – 56.0)
4. **Used private delivery facility**	Binary	All women with birth 5 years prior to survey who delivered in a health facility	1,143	-	1,143	17.7% (13.1 – 23.6)

Complex survey design was accounted for in calculations of proportions and confidence intervals. 95%CI: 95% confidence interval.

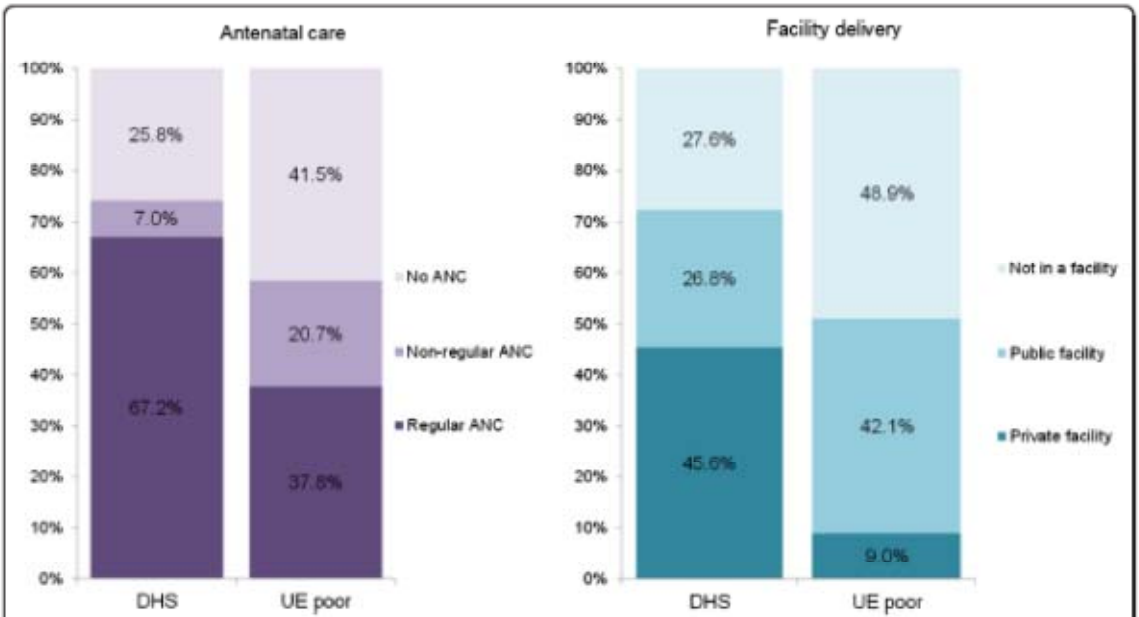

Figure 3 Proportion of women with a birth in the five-year period preceding the surveys (DHS 2008 and 2010/2011 Upper Egypt [UE]) by maternal health-seeking behaviours. Regular ANC: 4 or more ANC visits during pregnancy. DHS - Nationally representative sample of women form the 2008 Demographic and Health Survey. Complex survey design was accounted for in calculations of proportions.

and higher economic resourcefulness were associated with increased odds of having received any ANC (Table 6). A one unit increase in socio-cultural resourcefulness was independently associated with a 16% increase in the odds of ANC (OR = 1.16, 95% CI 1.02-1.32) and a one unit increase in economic resourcefulness was associated with a 27% increase in the odds of ANC (OR = 1.27, 95% CI: 1.08-1.49). Women's status or dwelling quality scores were not associated with receiving ANC. Women in the oldest age group (40 years and above) had significantly lower odds (OR = 0.64, 95% CI: 0.49-0.85) of receiving ANC compared to women in the reference group (35–39 years).

Regular ANC use

Women who reported receiving any ANC care comprised the sample for analysis of regular ANC use determinants. In adjusted analysis, socio-cultural resourcefulness was associated with the odds of receiving regular ANC. A one unit increase in socio-cultural resourcefulness was associated with 17% higher odds of regular use of ANC (OR = 1.17, 95% CI: 1.01-1.36). None of the remaining latent variables, demographic or geographic variables were associated with receiving regular ANC.

Table 3 Goodness of fit measures for four latent variables

Latent variable	CFI	TLI	RMSEA
Socio-cultural resourcefulness	0.986	0.971	0.024
Economic resourcefulness	0.974	0.963	0.020
Dwelling quality	0.990	0.970	0.023
Woman's status	0.995	0.992	0.032

CFI: Comparative Fit Index. TLI: Tucker Lewis Index. RMSEA: Root Mean Square Error of Approximation.

Facility delivery

Economic resourcefulness was associated with facility use for delivery care. The effect of a one unit increase in economic resourcefulness was associated with 19% lower odds of delivering in a facility (95% CI: 0.69-0.95). A one unit increase in socio-cultural resourcefulness was associated with a 14% increase in the odds of facility delivery (95% CI: 1.02-1.28). Dwelling quality or women's status were not associated with facility delivery. Women in the oldest age group had 45% higher odds (95% CI: 1.10-1.91) of delivering in a health facility compared to women in the reference group. Women living in households with fewer than five children were more likely than those living in households with 5–6 children to deliver in a health facility. Women who reported receiving ANC had nearly double the odds of delivering in a health facility.

Private delivery facility use

Among the sample of women who reported delivering in a facility, neither socio-cultural nor economic resourcefulness were associated with the use of private delivery facility. On the other hand, a one unit increase in dwelling

Table 4 Descriptive characteristics of component variables in latent variables, among sample of women who gave birth in 5 year preceding survey (n = 2,254)

Component variables	Distribution	Standardised factor loading (SE)
A. Socio-cultural resourcefulness		
Woman: years of education		
Mean (95% CI)	2.50 (2.15-2.84)	0.706 (0.035)
Woman: literacy		
Illiterate (column %)	70.7	0.745 (0.034)
Reads/writes with difficulty	8.1	
Reads/writes easily	20.9	
Missing	0.3	
Male head of household: years of education*		
Mean (95% CI)	4.92 (4.55-5.29)	0.670 (0.043)
Male head of household: occupational category*		
Not in employment/no male head of household (column %)	10.9	0.253 (0.032)
Manual or Agricultural worker	73.5	
Higher (Sales, Clerical, Professional)	15.6	
School enrolment of children 7–18 years old (binary)		
All children enrolled/No children 7–18 (%)	89.5	0.459 (0.054)
Identity documents among members of household (binary)		
All members have identity documents (%)	68.8	0.208 (0.043)
Percentage of adult household members (18 years+) that ever attended education		
Mean (95% CI)	49.8 (46.8-52.8)	0.902 (0.037)
B. Economic resourcefulness (rural)		
Household asset ownership (binary)		
Refrigerator (%)	40.2	0.368 (0.046)
Dwelling is a house or apartment (%)	54.6	0.402 (0.036)
Colour TV (%)	42.7	0.223 (0.034)
Washing machine (%)	67.2	0.238 (0.063)
Access to means of agricultural production (binary)		
Own, co-own or rent land (%)	13.1	0.780 (0.036)
Own buffalo (%)	10.2	0.670 (0.046)
Own cows (%)	3.8	0.650 (0.060)
Own horse (%)	13.7	0.735 (0.040)
Own goat or sheep (%)	12.3	0.641 (0.044)
Own poultry (%)	50.2	0.521 (0.030)
Household consumption (binary)		
Have access to ration card (%)	56.5	0.405 (0.049)
Youngest child of school age consumed fruit in last 24 hours (%)	15.3	0.236 (0.049)
C. Dwelling quality		
Dwelling utilities (binary)		
Piped water connection (%)	74.9	0.422 (0.066)
Landline phone (%)	5.9	0.197 (0.063)
Electricity from public network (%)	89.5	0.690 (0.096)

Table 4 Descriptive characteristics of component variables in latent variables, among sample of women who gave birth in 5 year preceding survey (n = 2,254) *(Continued)*

Construction materials (binary)		
Floor from cement, tile or plastic (%)	36.8	0.651 (0.063)
Ceiling from concrete or tile (%)	41.6	0.711 (0.073)
Walls from red brick (%)	74.3	0.716 (0.084)
D. Mobility and decision-making of female head of household		
Mobility: leave the house		
Not allowed (column %)	2.3	0.874 (0.009)
Allowed with permission	70.2	
Allowed with notice/without permission	27.5	
Missing	-	
Mobility: go to the market		
Not allowed (column %)	28.6	0.697 (0.021)
Allowed with permission	44.3	
Allowed with notice/without permission	27.1	
Missing	-	
Mobility: go to hospital		
Not allowed (column %)	1.4	0.865 (0.011)
Allowed with permission	69.2	
Allowed with notice/without permission	29.4	
Missing	-	
Mobility: visit relatives		
Not allowed (column %)	3.5	0.814 (0.013)
Allowed with permission	67.0	
Allowed with notice/without permission	29.5	
Missing	-	
Mobility: visit neighbours		
Not allowed (column %)	10.8	0.732 (0.018)
Allowed with permission	46.4	
Allowed with notice/without permission	42.8	
Missing	-	
Mobility: run an errand		
Not allowed (column %)	19.6	0.538 (0.028)
Allowed with permission	51.7	
Allowed with notice/without permission	28.7	
Missing	-	
Decision-making about household budget		
Someone else (column %)	1.6	0.429 (0.029)
Male head of household solely	51.9	
Female head of household or jointly	46.3	
Missing	0.2	

Table 4 Descriptive characteristics of component variables in latent variables, among sample of women who gave birth in 5 year preceding survey (n = 2,254) *(Continued)*

Decision-making about visiting friends or family		
Someone else (column %)	0.6	0.457 (0.038)
Male head of household solely	61.3	
Female head of household or jointly	37.8	
Missing	0.3	

*87 households have no male head of household – values coded as missing.
No missing data.
95% CI: 95% confidence interval SE: Standard error svyset applied in calculation of distribution. No missing data.

quality score was associated with a 48% increase in the odds of private facility use (95% CI: 1.07-2.04). Women's status, age group or the number of children in household were not associated with private facility use. Residence in Sohag governorate was associated with a nearly two-fold increase in the odds of private delivery facility use compared to residence in Assiut. Lastly, women who received any ANC had 1.87 higher odds (95% CI: 1.16-3.01) of using private delivery facilities compared to women who did not.

In all four models, the inclusion of variables capturing size of the village and district of residence had no meaningful effects on the estimates of association between the four SEP variables and health-seeking behaviour outcomes, and were therefore no included in the final models.

Discussion

We found that the level of ANC and facility delivery utilisation in the poor Upper Egypt sample was lower than the national average, but higher than reported by the poorest DHS wealth quintile residing in the Upper Egypt region. The proportion of ANC users receiving regular ANC was lower among the Upper Egypt poor than in the nationally-representative sample. The proportion of women who used private delivery care among women who delivered in facilities was 63% in the national sample compared to less than one fifth among the Upper Egypt poor. In this paper, we conducted exploratory factor analysis of potential indicators and constructed four latent variables: socio-cultural resourcefulness, economic resourcefulness, dwelling quality and woman's status. We identified socio-cultural resourcefulness as capturing the

Table 5 Correlation coefficients between socio-economic position variables and p-values and crude associations between area-level and socio-economic position variables

		Socio-cultural resourcefulness	Economic resourcefulness	Dwelling quality	Woman's status
A. Correlation coefficients between socio-economic position variables and p-values					
Socio-cultural resourcefulness		1.0000			
Economic resourcefulness		−0.0068 (0.749)	1.0000		
Dwelling quality		0.1687 (<0.001)	0.0084 (0.691)	1.0000	
Woman's status		−0.0299 (0.157)	0.0411 (0.052)	0.0028 (0.896)	1.0000
B. Crude associations between area-level and socio-economic position variables					
		Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Village size	Small (<6,500)	−0.016 (0.082)	−0.058 (0.078)	−0.105 (0.062)	0.085 (0.096)
	Medium (6,500-14,499)	−0.048 (0.078)	0.165 (0.047)	−0.070 (0.087)	−0.063 (0.075)
	Large (>14,500)	0.033 (0.084)	0.032 (0.062)	0.041 (0.054)	0.037 (0.048)
	p-value	*0.200*	*<0.001*	*<0.001*	*0.017*
District size	Small (<249 K)	−0.085 (0.065)	0.130 (0.042)	−0.080 (0.078)	−0.031 (0.046)
	Medium (250 K-349 K)	−0.028 (0.093)	0.122 (0.061)	0.031 (0.048)	0.009 (0.102)
	Large (>350 K)	0.105 (0.095)	−0.067 (0.070)	0.003 (0.077)	0.066 (0.056)
	p-value	*<0.001*	*<0.001*	*0.009*	*0.096*
Governorate	Assiut	0.018 (0.075)	−0.024 (0.050)	−0.012 (0.060)	0.019 (0.046)
	Sohag	−0.033 (0.063)	0.185 (0.045)	−0.032 (0.054)	0.008 (0.066)
	p-value	*0.216*	*<0.001*	*0.564*	*0.791*

SE – standard error. P-value of ANOVA.

Table 6 Multivariate analysis of determinants of maternal health-seeking behaviours among women in Upper Egypt households living below the poverty line

Variable	Any ANC		Regular ANC		Facility delivery		Private delivery care	
Sample size	2,242		1,266		2,240		1,143	
	OR (95% CI)	*p-value*	*OR (95% CI)*	*p-value*	*OR (95% CI)*	*p-value*	*OR (95% CI)*	*p-value*
Socio-cultural resourcefulness*	1.16 (1.02-1.32)	0.022	1.17 (1.01-1.36)	0.038	1.14 (1.02-1.28)	0.028	1.04 (0.85-1.27)	0.705
Economic resourcefulness*	1.27 (1.08-1.49)	0.004	0.97 (0.78-1.19)	0.747	0.81 (0.69-0.95)	0.009	0.91 (0.66-1.25)	0.538
Dwelling quality*	1.10 (0.96-1.26)	0.159	0.95 (0.80-1.12)	0.512	1.08 (0.93-1.26)	0.291	1.48 (1.07-2.04)	0.019
Woman's status*	0.92 (0.80-1.06)	0.228	0.97 (0.80-1.16)	0.707	1.07 (0.93-1.23)	0.314	0.98 (0.76-1.26)	0.852
Woman's age group								
18-24	1.48 (0.87-2.40)	0.147	0.70 (0.31-1.59)	0.387	0.87 (0.46-1.62)	0.649	1.39 (0.49-3.95)	0.526
25-29	0.91 (0.69-1.20)	0.500	0.83 (0.49-1.43)	0.507	1.05 (0.82-1.36)	0.676	0.52 (0.25-1.09)	0.081
30-34	1.10 (0.82-1.48)	0.503	0.90 (0.59-1.37)	0.619	0.90 (0.67-1.22)	0.516	1.23 (0.77-1.94)	0.380
35-39	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
40 and above	0.64 (0.49-0.85)	0.002	0.89 (0.55-1.44)	0.639	1.45 (1.10-1.91)	0.009	0.76 (0.44-1.29)	0.300
Number of children								
1-2	1.62 (0.93-2.84)	0.089	1.10 (0.55-2.22)	0.784	2.07 (1.36-3.14)	0.001	0.80 (0.32-2.02)	0.628
3-4	0.99 (0.79-1.26)	0.953	0.79 (0.57-1.10)	0.156	1.40 (1.12-1.74)	0.003	1.20 (0.73-1.97)	0.456
5-6	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
7 or more	0.79 (0.56-1.11)	0.167	0.87 (0.54-1.40)	0.553	1.06 (0.74-1.51)	0.751	1.06 (0.63-1.78)	0.836
Governorate								
Assiut	1 (ref)		1 (ref)		1 (ref)		1 (ref)	
Sohag	0.78 (0.60-1.01)	0.059	1.08 (0.80-1.46)	0.589	0.78 (0.53-1.15)	0.206	1.91 (0.97-3.74)	0.060
Received any ANC								
No					1 (ref)		1 (ref)	
Yes					1.96 (1.57-2.45)	<0.001	1.87 (1.16-3.01)	0.011

*Continuous variables; odds ratio associated with one unit increase in score. p-value of Wald test. OR: Odds ratio. 95% CI: 95% confidence interval.

socio-cultural capital of the woman whose maternal health-seeking behaviour as well as additional characteristics of the household. Economic resourcefulness reflected the unobserved construct of accumulated resources available to rural households [31,32]. Together, they described the individual and household-level factors that are hypothesised to be associated with the process of choice related to pregnancy and delivery care [33].

The character of ANC is largely preventive and conducted on an outpatient/clinic basis, while facility delivery care is inpatient, intensive and potentially invasive. Differences in perceptions of the need for ANC and facility delivery may help explain the fact that whereas increasing economic resourcefulness was associated with higher odds of receiving ANC, it was associated with lower odds of facility delivery. Socio-cultural resourcefulness was positively associated with receiving any ANC, regular ANC and facility delivery, whereas it was not associated with private delivery care. Women with higher dwelling quality scores were more likely to deliver in a private facility, possibly capturing the more urbanised character of locations that are attractive to private health providers and greater availability of such services. Woman's status was not independently associated with any of the four health-seeking behaviours. The importance of exposure to health services and pregnancy information is exemplified in the strong association between receiving ANC and the odds of facility delivery. However, the content and quality of the interaction between the pregnant woman and the health professional and resulting expectations from health providers needs to be better understood in light of our finding that receipt of any ANC also predicted private delivery care.

Strengths and limitations

Study type and participants

This study was conducted on a sample of poor households residing in Upper Egypt which applied to a conditional cash transfer program and fulfilled its eligibility criteria. Therefore, the levels of maternal health-seeking cannot be interpreted as being representative of all Assiut and Sohag households living below the poverty line, as the sample was unlikely to have captured the most marginalised and vulnerable poor households. However, the

households captured in this dataset are potentially the type of households that would be more likely to participate in programmes designed to improve coverage of essential care, for example those related to maternal and child health. Data was collected in a cross-sectional survey conducted in 2010/11 with a high overall response rate of 97.1%. To capture the most up-to-date patterns of health-seeking behaviour, we analysed the circumstances surrounding the most recent birth in the five-year recall period. However, this analysis faced several limitations. The cross-sectional and observational design of this study limited our ability to assess causal relationships between SEP and health-seeking behaviours.

Measurement of exposures

The four latent SEP measures constructed and used in this study relied on observed self-reported variables, which are easy to collect and process but may present some risk of reporting bias due to the particular context of data collection. The dataset used contained low proportions of missing data in the component variables of each SEP measure.

Measurement of outcomes

All measures of health-seeking behaviour analysed in this study were self-reported. Whereas we expect the report of the occurrence of a live birth in the recall period to be reliable, the health-seeking behaviour variables may be impacted by measurement error and recall bias.

Statistical model

The main strength of this study stems from the inclusion of both socio-cultural and economic measures in the model predicting their association with various dimensions of maternal health-seeking behaviour. While we attempted to identify and include all potential confounders, the presence and extent of unmeasured confounding cannot be completely ruled out. There are several potential sources of unmeasured confounding. Data on women's parity was not collected. Our analysis of the 2008 DHS showed that age group is strongly associated with parity among women living in Upper Egypt [34]. As proxies for parity, we used woman's age group and number of children living in her household. Potentially, the number of children, in addition to being strongly correlated with parity, also captured the extent of the woman's ability to be absent for the duration of receiving care. Information on the existence of pregnancy complications, which had previously been shown to be positively associated with maternal care utilisation, was not collected and thus could not be used in the adjusted analysis.

Consideration of health services availability and quality

Village size, district size and governorate variables were considered for inclusion in the analysis as potential confounders because they are associated with the extent of urbanisation (components in both economic resourcefulness and dwelling quality). For instance, districts with larger populations might have a higher number and higher level of health facilities compared to smaller districts, potentially reducing the direct and indirect costs of obtaining maternal care. We were unable to access more detailed data on health facilities (location, level, public or private ownership) in order to describe these potential of association more precisely. Moreover, information about the existence of health facilities does not necessary mean that such facilities are functioning and providing health services. Localised information on quality and reliability of health services in Egypt was not available.

Conclusion

Socio-economically structured inequities in health coverage play a significant role in gaps in maternal health coverage, globally and in Egypt [35-38]. Further improvements in maternal health indicators are therefore highly dependent on increasing coverage among the poorest and most disadvantaged segments of society [39-41]. In this paper, we found that the construction of socio-economic position measures among households living below the poverty line necessitated the use of indicators capturing resourcefulness. The resulting latent variables of socio-cultural and economic resourcefulness were useful predictors of receiving ANC and delivery care, although effect sizes were modest. However, in order to better understand characteristics of maternal care (i.e., regularity of ANC and choice of provider for delivery care), multidisciplinary research is needed to explore issues surrounding availability, accessibility and quality of maternal health services, as well as cultural attitudes.

Analysis of social and economic determinants of health behaviours and health outcomes has progressed from a limited descriptive approach to focusing on identifying determinants which may be amenable to intervention. The latter approach is needed especially in contexts with a substantial proportion of the population living in poverty, such as Egypt, in order to design targeted and effective interventions to improve health status. Programmes designed to narrow the gap in reproductive and maternal care utilisation have been implemented in many countries. These include, for example, voucher schemes and monetary rewards for utilisation of pregnancy and delivery care [42-44], removal of user fees [45,46], creation of community or micro health insurance [47,48], women's groups [49,50], conditional cash transfers [51-53], birth preparedness planning [54], provider social franchising [55,56], mobile banking and savings schemes [57], and private

provider reimbursement [58]. While these interventions may target or affect both the demand for and the supply and quality of maternal health services, their results thus far have been equivocal [59].

In light of the state of research in this field, our analysis opens another avenue for reflection. We attempted to enhance the understanding of the individual and household circumstances which enable women from poor households to seek maternal care. With the use of expanded understanding of individual and household-level SEP in rural areas, we showed that socio-economic circumstances are important predictors of maternal health-seeking behaviour alongside other known factors such as age and geographic location. We also found that women's status, encompassing mobility and decision-making, appeared to matter less in these processes than socio-cultural and economic resources. This is perhaps because motherhood is a more 'traditional' empowerment resource that is governed by different cultural rules and norms than those that indicate development markers of women's autonomy or empowerment. However, we must approach analysis of health-seeking behaviour as a set of discreet dimensions – for example, by separating the use of any ANC from the use of timely and regular ANC. The interventions that can potentially increase the proportion of women accessing any ANC may be different from those encouraging early and regular ANC among ANC users. In this regard, our analysis of the 2008 DHS showed that other considerations, such as preference for private care, may be driving expenditures on care that among the poor could reach catastrophic proportions [34]. We believe that future research may be able to build on our findings by approaching poor households in a more nuanced perspective.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
LB conceptualised the study. HS and LB worked on the design and data collection for the cross-sectional study, and cleaning the resulting dataset. LB conducted the analysis and prepared the first draft of the manuscript. All authors contributed to the interpretation of the data and the preparation of the final manuscript. All authors read and approved the final manuscript.

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10.11 Appendix K. Upper Egypt survey: Women's health module codebook

If female respondent currently married (Q207=1)
Q501: Are you currently pregnant?
1 Yes →Q502
2 No
3 Not sure
. Not applicable

If 1 in Q501
Q502: How many months pregnant are you?
Numeric value (range 1-9)
. Not applicable

If female respondent ever been married
Q503: When was the last time you were pregnant?
1 Less than a year ago
2 More than a year but less than 5 years ago
3 More than five years ago →Q510
4 Never been pregnant →Q510
. Not applicable

If pregnant now or pregnant less than 5 years ago (Q501=1 or Q503=1 or 2)
Q504: Do you go (did you go) to seek medical care during your pregnancy (your previous
1 Yes
2 No →Q508
. Not applicable

If yes in Q504
Q505: When was the first time you went to seek medical care during your pregnancy?
Numeric value (range 1-9)
-3 Missing
. Not applicable

If yes in Q504
Q506: When was the last time you went to seek medical care during your pregnancy?
Numeric value (range 1-9)
-3 Missing
. Not applicable

If yes in Q504
Q507: During your last pregnancy, how many times did you seek medical care to monitor your pregnancy?
Numeric value (range 1-32)
-9 Doesn't know/remember
-3 Missing
. Not applicable

If no in Q504
Why did you not seek care?
Q508_1: The pregnancy was normal and there were no problems.
Q508_2: I am not used to going to monitor a pregnancy.
Q508_3: I didn't know I was pregnant.
Q508_4: Due to my circumstances.
Q508_5: Financial circumstances.
Q508_6: Other reasons.
1 Yes
2 No
-3 Missing
. Not applicable

If pregnant now or pregnant less than 5 years ago (Q501=1 or Q503=1 or 2)
Q509: Where did you give birth the last time?
1 At home
2 Still pregnant
3 Urban hospital (public/in the district)
4 Urban health unit
5 Center for care for mothers and children
6 Private clinic or hospital
7 Polyclinic
8 Private doctor
9 Other
-3 Missing
. Not applicable